NOVEMBER, 1956

modern castings

Owned by

THE MEN WHO BUY

High Temperature Sand Tests

Special 12-page bonus section with 22 illustrations describes how to make better castings by testing sand at high temperatures

International Congress

Castings exhibits dominate show as Germans go after the business

Nodular Iron a New Way

Allis-Chalmers announces new process to make nodular iron

Shaw Process

Ceramic mold casting technique now used for castings to 700 lb

Bottom Boards

Here's an eight-point program to make bottom boards last longer

Shell Pattern Equipment

Follow these design tips and they will help you keep out of trouble

Aid for Colleges

Cornell University president asks industry program to help schools

◆ Cover Photo

International Castings Congress at Dusseldorf, Germany, featured machinery as well as castings. This is one of at least four operating sand systems.

future meetings and exhibits

NOVEMBER

7-9 . . Steel Founders' Society of America, *Carter Hotel, Cleveland. Technical & Operating Conference.*

8-9 . . All-Canadian Foundry Conference, *Mount Royal Hotel, Montreal, Que. Sponsored by Eastern Canada and Ontario Chapters of the American Foundrymen's Society.*

13-15 . . Investment Casting Institute, *Sheraton-Cadillac Hotel, Detroit. Annual Meeting.*

25-30 . . American Society of Mechanical Engineers, *Hotel Statler, New York. Annual Meeting.*

26-30 . . Third International Automation Exposition, *Trade Show Bldg., New York.*

29-30 . . Michigan Regional Foundry Conference, *University of Michigan, Union Bldg., Ann Arbor, Mich. Sponsored by the Detroit, Saginaw Valley, Central Michigan, and Western Michigan Chapters of the American Foundrymen's Society, and the University of Michigan and Michigan State University Student Chapters.*

DECEMBER

5-7 . . American Institute of Mining and Metallurgical Engineers, *Morrison Hotel, Chicago. Electric Furnace Steel Conference.*

10-11 . . Material Handling Institute, Inc., *Biltmore Hotel, New York. Annual Meeting.*

1957

JANUARY

18 . . Malleable Founders' Society, *Hotel Cleveland, Cleveland. Semi-Annual Meeting.*

FEBRUARY

4-8 . . American Society for Testing Materials, *Benjamin Franklin Hotel, Spring Meeting.*

14-15 . . Wisconsin Regional Conference, *Hotel Schroeder, Milwaukee. Sponsored by the Wisconsin Chapter and the University of Wisconsin Student Chapter of the American Foundrymen's Society.*

21-22 . . Southeastern Regional Foundry Conference, *Dinkler-Tutwiler Hotel, Birmingham, Ala. Sponsored by the Birmingham and Tennessee Chapters and*

the University of Alabama Student Chapter of the American Foundrymen's Society.

MARCH

11-15 . . Nuclear Congress, *Convention Hall, Philadelphia.*

13-14 . . Foundry Educational Foundation, *Hotel Cleveland, Cleveland. College-Industry Conference.*

15-16 . . California Regional Foundry Conference, *Claremont Hotel, Berkeley, Calif. Sponsored by the Northern California and Southern California Chapters of the American Foundrymen's Society.*

18-19 . . Steel Founders' Society of America, *Drake Hotel, Chicago. Annual Meeting.*

25-29 . . American Society for Metals, *Pan-Pacific Auditorium, Los Angeles. Tenth Western Metal Exposition and Congress.*

APRIL

10-11 . . Malleable Founders' Society, *Edgewater Beach Hotel, Chicago. Market Development Conference.*

12-13 . . East Coast Regional Foundry Conference, *Benjamin Franklin Hotel, Philadelphia. Sponsored by the Philadelphia, Metropolitan and Chesapeake Chapters of the American Foundrymen's Society.*

MAY

6-10 . . American Foundrymen's Society, *Cincinnati. Castings Congress.*

JUNE

13-14 . . Malleable Founders' Society, *The Broadmoor, Colorado Springs, Colo. Annual Meeting.*

16-21 . . American Society for Testing Materials, *Chalfonte-Haddon Hall, Atlantic City, N. J. Annual Meeting.*

20-22 . . Penn State Regional Foundry Conference, *Penn State University, State University, Pa. Sponsored by the Rochester, Pittsburgh, Metropolitan, Eastern New York, Western New York, Northwestern Pennsylvania, Central New York, Chesapeake and Philadelphia Chapters and the Penn State University Student Chapter of the American Foundrymen's Society and the Reading Foundrymen's Assn. and Conestoga Foundrymen's Assn.*

23-25 . . Alloy Casting Institute. *The Homestead, Hot Springs, Va. Annual Meeting.*

CIRCLE NO. 122, PAGE 13-14

Malleable Foundries Form Foundation for Research

The Malleable Research & Development Foundation, a new organization to promote technical progress in the foundry industry, has been incorporated by five leading malleable casting foundries.

Organizers of the foundation are the Albion Malleable Iron Co., Albion, Mich.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Dayton Malleable Iron Co., Dayton, Ohio; National Malleable & Steel Castings Co., Cleveland, and Wagner Malleable Iron Co., Decatur, Ill. These companies are independent high-production foundries in the malleable casting industry.

This organization will be concerned with the technical, not the marketing phases of the industry. It will seek to develop methods of making better castings at a lower cost. Its objectives are to promote the general welfare of the malleable castings industry through scientific and industrial research and to assist in the discovery and development of new products, better processes and improved equipment for production foundries.

Membership in the foundation is open to other malleable foundries. To qualify a company must sell at least 60 per cent of its production of malleable castings to other than affiliated concerns. In addition, it must operate a malleable iron foundry equipped with power-driven mold conveyors, and mold and pour continuously for eight hours or more. It also must have a reasonably well equipped and adequately staffed research department devoting substantial time to research and development.

The foundation will be managed by a board of trustees comprised of the following: Collins L. Carter, president, Albion Malleable Iron Co.; Waldo V. Tiscornia, executive vice president, Auto Specialties Mfg. Co.; Anthony Haswell, president, Dayton Malleable Iron Co.; Wilson H. Moriarty, first vice president, National Malleable & Steel Castings Co. and John A. Wagner, president, Wagner Malleable Iron Co.

CIRCLE NO. 123, PAGE 13-14

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vol. 30, no. 5

modern castings

in this issue

BUYERS SECTION

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On The Management Side

■ A remarkable change has been going on in the terms of labor contracts signed by foundries. In 1954 the National Foundry Association found that 56 per cent of its members' contracts were for one year duration. Only six per cent were for as long as three years.

But at the close of the 1956 foundry bargaining season, according to *The Iron Age*, only 22 per cent of the new contracts were for one year, 42 per cent were two years and 36 per cent were for three years. Seventy-one per cent of the two- and three-year contracts provide for automatic wage inceases in 1957.

The Chicago Foundry Association agreement, which covers 68 foundries, provides wage gains of 7¢ to 17¢ for the first year with an additional 5¢ to 10¢ in 1957. It runs until 1959 but can be reopened for wage negotiations in 1958.

■ Foundries can fail even though they own things worth more than they owe. This warning comes from Edward F. Reiter, vice president of the Commercial National Bank of Peoria, Ill., who wrote the recent Small Business Administration pamphlet on "Planning Your Working Capital Requirements."

"Experience shows that more businesses fail in the presence of a balance-sheet surplus than otherwise," Reiter warns. "The critical factor is cash in working capital."

■ There is absolutely no sign of a falling off in expenditures for new plant and equipment in the last half of 1956 according to the latest survey conducted jointly by the Department of Commerce and the SEC. Presently scheduled expansions call for total expenditures of $35.3 billion, which is 23 per cent above the record total of 1955.

Estimates are not specifically available for the castings industry but they are for the primary metals industries which include foundries. Here are expenditures and estimates for three years:

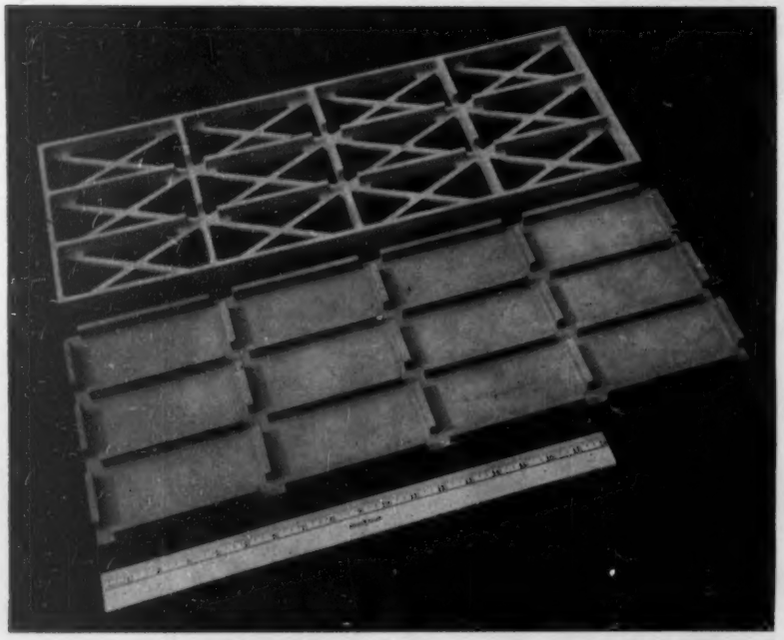
	Primary Iron and Steel	Primary Nonferrous
1954	$ 754,000,000	$246,000,000
1955	863,000,000	214,000,000
1956	1,274,000,000	418,000,000

Here are estimates for the four quarters of 1956:

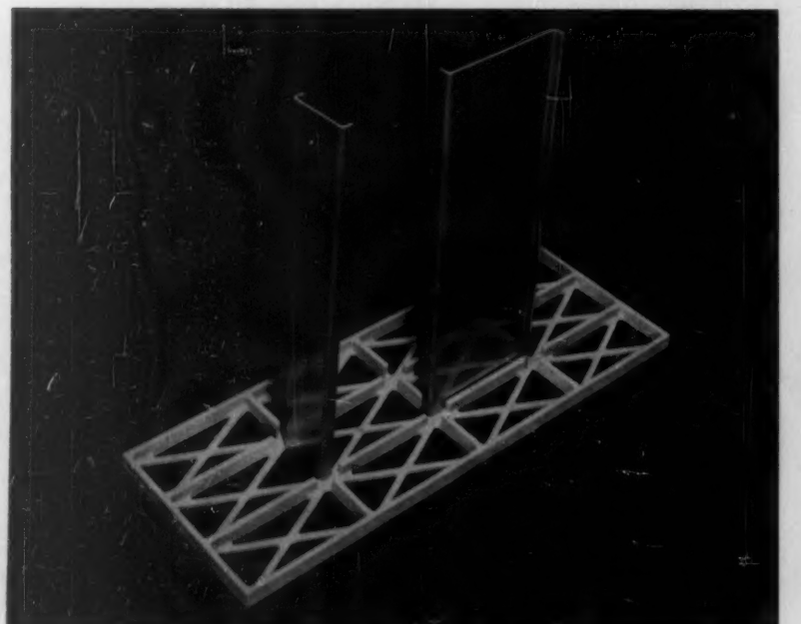
	Iron and Steel Primary	Nonferrous Primary
1st Quarter	$219,000,000	$ 69,000,000
2nd Quarter	306,000,000	88,000,000
3rd Quarter	319,000,000	126,000,000
4th Quarter	430,000,000	135,000,000

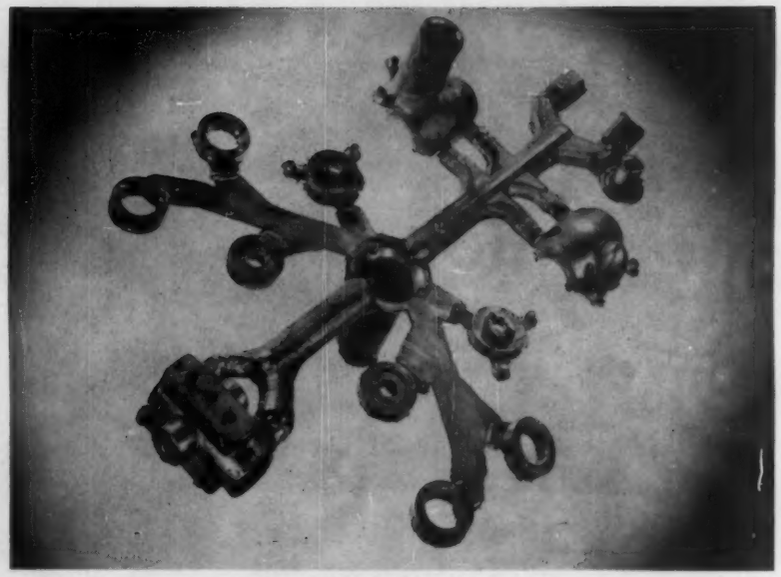
■ It's sound business policy to use the new tax depreciation methods permitted by the Internal Revenue Code of 1954. The Machinery & Allied Products Institute has concluded that the gains in the after-tax rate of return on the investment in medium-lived assets are 10 to 15 per cent higher with the new methods than with the traditional straight-line writeoff.

modern castings album

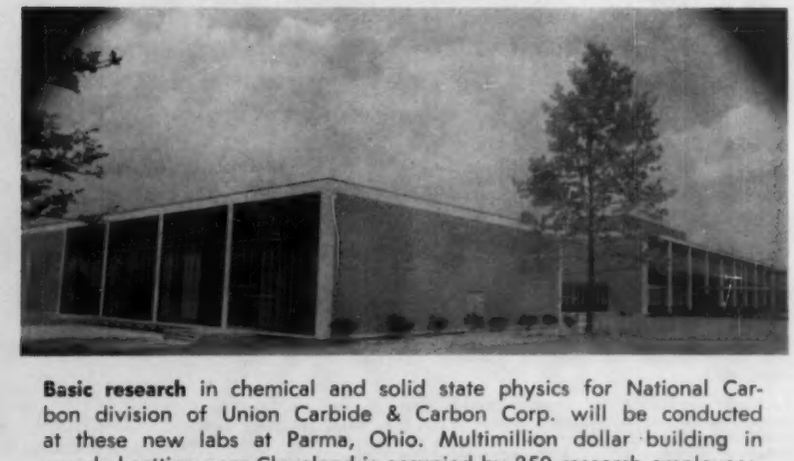


Cast "building blocks" for electronic equipment are these 356 aluminum parts developed by Northrop Aircraft, Inc. The designers claim that use of their brain child makes rapid assembly of radar or other electronic chassis as easy as using a child's building set. Two types of castings are used, and they may be produced as either sand or die castings. One casting (above) is made with diagonal openwork ribs where air conditioning for components is necessary, and the other is cast solid to permit shielding against interference. Castings are 9 x 24-in. but are segmented in 3 x 6-in. increments. Aluminum shelves (below) to fit any combination of segments are prefabricated and may be fastened to the chassis sides with basket nuts. Although designed for use in the USAF Northrop SM-62 Snark intercontinental missile, these castings may find use in radio hookups, TV, hi-fi components or any other electronic chassis development.





Fourteen zinc parts that fit together to make an electric hoe are die cast on one gate simultaneously. This new tool for the home gardener is being built by W. R. Brown Co., Chicago. After casting, the 14 components are trimmed in a single operation with one trim die. Maintenance of close tolerances and coring of holes in the parts reduces machining to the drilling of five holes. Zinc parts are said to withstand the hard usage the hoe encounters in abrasive soils.



Basic research in chemical and solid state physics for National Carbon division of Union Carbide & Carbon Corp. will be conducted at these new labs at Parma, Ohio. Multimillion dollar building in wooded setting near Cleveland is occupied by 350 research employees.

How Local Jobbing Foundry Competes Through Control Of Shop and Front Office

■ How can a local jobbing foundry shop compete as more foundries turn to specialization? Control appears to be the key, engineering control as well as accounting and cost control.

By adopting such methods, the Advance Foundry Company of Dayton, Ohio, produces not only short runs of standard iron, including solid and cored molds, but also a good tonnage of forming dies for the auto industry. This foundry has an overall monthly production of 900 tons composed of four basic types of iron produced regularly.

Utilization of controls begins with the sand, daily tests are made for moisture, green compression, green permeability, dry premability, deformation, toughness, hardness and dry tensile strength. The sand preparation and handling system is automatic and consists of overhead and floor level hoppers, a muller and paddle mixer, belt and bucket conveyors integrated to operate through two control panels.

By automatically preparing and delivering the sand with the system

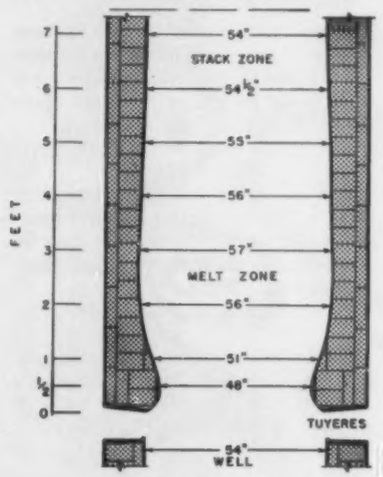


Fig. 1 Standard Cupola contour.

which can handle up to 50 tons hourly, closer control of the mix is attained, molding time cut and extra handling eliminated.

Production of molds and cores is closely controlled. After the mold has been rammed with green sand

Continued on page 22

products and processes

Wood flour and seacoal produced as a one-package product. Mfr. claims on many foundry jobs 3 per cent Steve-Coal will replace 6 to 7-1/2 per cent seacoal with no other additive needed. *Frederick B. Stevens, Inc.*

CIRCLE NO. 1, PAGE 13-14

Crucible lips for aluminum and brass pouring are included with each new tilting furnace. They fit into a grooved slot and are said to provide a wider and more efficient pouring device. *Electro Refractories & Abrasives Corp.*

CIRCLE NO. 2, PAGE 13-14

Hardness tester model "Y" is a semi-automatic, high capacity unit. Pointer automatically zeros when minor load is applied. The cycle of major load is adjustable to less than two seconds. Power is supplied from a 110-v, 60 cycle, single phase ac line.

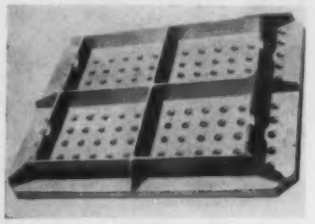
Wilson Mechanical Instrument Div., American Chain & Cable Company, Inc.

CIRCLE NO. 3, PAGE 13-14

Refractory strainer cores are said to withstand 3000 F without spalling or disintegrating. They are available up to 4-1/2 in. *Star Porcelain Company.*

CIRCLE NO. 4, PAGE 13-14

Aluminum bottom boards are cast with vent holes on face to permit gas escapement. Durability and



strength are achieved by reinforced rib construction. Available in 80 sizes. *Jo-El Company.*

CIRCLE NO. 5, PAGE 13-14

Automatic pressure blast unit features in-line conveyorization and automatic rinsing and drying. It has production rate of six linear feet on parts up to 20 in. in width. *Cro-Plate Co., Inc.*

CIRCLE NO. 6, PAGE 13-14

Pallet truck, all-welded construction with steel ball bearing swivel casters has 1500 lb capacity and may be pushed or pulled by one man. *Rack Engineering Co.*

CIRCLE NO. 7, PAGE 13-14

Drying binders known as Kernfix permit manufacture of cores and molds for non-ferrous casting with little or no oven drying. *Kernfest, K. G.*

CIRCLE NO. 8, PAGE 13-14

Aluminum laboratory clamps are said to offer greater safety in handling inflammable or dangerous liquids. They also have a natural resistance to corrosion. *Chicago Apparatus Company.*

CIRCLE NO. 9, PAGE 13-14

Portable belt conveyors made in two sizes; one has 4000 lb load capacity and expands from 26 to 43 feet; second unit has 1000 lb capacity

and expands from 15 to 25 feet; both have 16 in. belts with speeds of 78 and 75 pfm. *The Colson Corporation.*

CIRCLE NO. 10, PAGE 13-14

Dump truck with hydraulically tilted body has two and a half cu yd capacity. Body length is 6-3/4 ft and

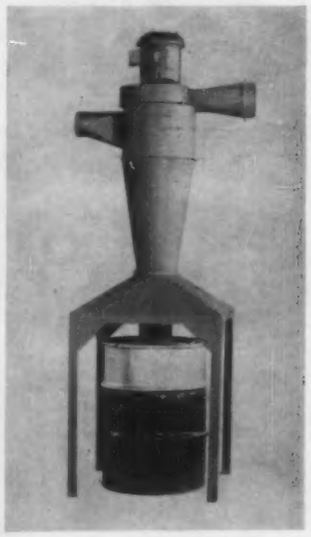
3 ft wide. Body tilts at 45 deg angle. Operated by storage battery. *Market Forge Company.*

CIRCLE NO. 11, PAGE 13-14

Electronic erosion machine reproduces directly the shape and profile of a soft master electrode in carbide or hardened alloy through use of a spark with extreme accuracy and high finish. Servo motor holds the electrode at constant distance. *Abaco Industries, Inc.*

CIRCLE NO. 12, PAGE 13-14

Cyclone-type dust collector features connections to 55-gallon drums. The exhausting capacities range to 1100 cubic feet of air per minute. Rec-



ommended where large volume of dust, chips or shavings might tend to clog standard filters. *Torit Manufacturing Co.*

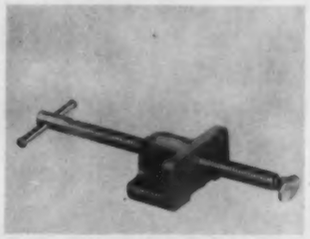
CIRCLE NO. 13, PAGE 13-14

Vacuum furnaces ranging up to 2000 lb capacity allow manufacture of precision components from high-pur-

ity alloys highly reactive in normal atmosphere. *F. J. Stokes Corporation.*

CIRCLE NO. 14, PAGE 13-14

Fixture lock features automatic clamping, releasing and positive screw tightening. Front and bottom are ma-



chined flat. Screw is cadmium plated with travel of 6-1/4 in. *Wilton Tool Mfg. Co., Inc.*

CIRCLE NO. 15, PAGE 13-14

Electrical heated furnaces to 2750 F employ silicon-carbide non-metallic heating elements and hearth. Each furnace requires transformer of dry type, auto wound, with two switches, each with six taps. *L & L Manufacturing Company.*

CIRCLE NO. 16, PAGE 13-14

Air arbor presses available in 16 models from one to five tons, either hand or foot controlled. They have

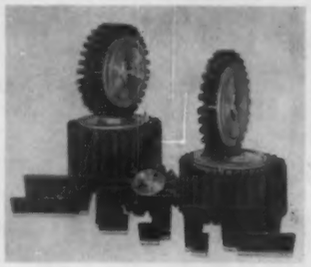
throat clearance up to 6-3/4 in. with adjustable ram up to 12 in. *Van Products Company.*

CIRCLE NO. 17, PAGE 13-14

Speed chucking lathes available in horizontal or vertical types. Designed for secondary operations such as deburring and polishing. May be used

with single, multiple or variable speed motors. *Standard Electric Tool Co.*
CIRCLE NO. 18, PAGE 13-14

Brush-backed polishing heads are available in short or long bristles and

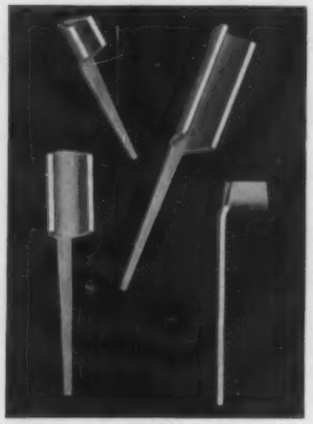


in several models for sanding, polishing or deburring. *Grinding & Polishing Machinery Corporation.*
CIRCLE NO. 19, PAGE 13-14

Transclucent fiberglass-plastic corrugated panels are for factory construction. They are nailed or screwed into place. Material is shatter-proof and light-diffusing. *Resolite Corporation.*
CIRCLE NO. 47, PAGE 13-14

Roof ventilation hoods are rectangular shaped and hinged for easy servicing. Eleven throat sizes available in gravity and powered models which deflect expelled air downward. *The Swartwout Company.*
CIRCLE NO. 20, PAGE 13-14

Chill nails combine principles of mass and surface to provide faster heat transfer and greater contact area for



maximum burn-in with metal and fusion. *Canton Chaplet and Chill Div., The W. L. Jenkins Co.*
CIRCLE NO. 21, PAGE 13-14

Industrial sweeper, battery powered, utilizes two motors, one for powering, other for brooms and dust control. May be used eight hours before recharging with 110 v system. Model

605E has three speeds forward and one in reverse. *Wayne Manufacturing Company.*

CIRCLE NO. 22, PAGE 13-14

Portable crane weighing 350 lb will carry 3000 lb load on single line. Gear winch has 7:1 ratio and a safety winch crank. May be tilted to get through low overhead. *Sasgen Derrick Company.*

CIRCLE NO. 23, PAGE 13-14

Cylindrical grinders in two sizes handle up to 6500 lb on centers. The graduated hand wheel continually indicates amount of infeed. The indexing mechanism permits settings in increments of 0.0001 in. work diameter reduction instantly and without visual attention. *Norton Company.*

CIRCLE NO. 24, PAGE 13-14

Water purifier is said to conserve water and steam. It is installed on low pressure line on exhaust side to remove impurities. Unit cleans the steam without moving parts. *V. D. Anderson Co. Div., International Basic Economy Corporation.*

CIRCLE NO. 25, PAGE 13-14

Air hammer delivers 2200 blows per min., weighs under four lbs and has chuck with six different positions. May be used for cutting, chipping, chiseling or grooving. *Superior Pneumatic & Mfg. Co.*

CIRCLE NO. 26, PAGE 13-14

Barrell finishing compounds added to Oakite line include an alkaline abrasive type, an acidic compound and an alkaline compound. The two former are for deburring the latter for finishing. *Oakite Products, Inc.*

CIRCLE NO. 27, PAGE 13-14

Rectifier welder with recessed control panel has polarity reversing switch and three coarse current adjustments with rheostat control for fine current adjustments. The rheostat may be removed for remote control. *Hobart Brothers Co.*

CIRCLE NO. 28, PAGE 13-14

Phone equipped headset provides ear protection from noise and allows communications through standard plug connected to jacks. Receivers do not interfere with accoustical seal. *Mine Safety Appliances Company.*

CIRCLE NO. 29, PAGE 13-14

Conveyorized tunnel oven 140 ft. long has been developed for heat treating of aluminum castings. It has a produc-

CIRCLE NO. 129, PAGE 13-14

tion rate of 150,000 lbs of castings in 24 hrs with temperatures to 450 F. *J. King Kent & Company.*

CIRCLE NO. 30, PAGE 13-14

Safety shutoff and alarm for automatically controlled processes requires no sensing elements. It is designed primarily for heat treating furnaces. The operation is a direct function of the signal of the automatic controller. *Damol Corporation.*

CIRCLE NO. 31, PAGE 13-14

Rubber hose which is highly abrasion resisting may be used for handling of hot chips and sands. *The B. F. Goodrich Company.*

CIRCLE NO. 32, PAGE 13-14

Portable stacking rack with open sides allows for easier counting, may be moved by fork lift or platform truck, and stacked to any practical height. Available in various sizes. Pressed Steel Div., *Republic Steel Corporation.*

CIRCLE NO. 33, PAGE 13-14

Die casting machine, model 600, has 30 hp motor and locking pressure of 600 tons. Hot chamber machine weighs 42,500 lb, cold chamber 35,-500. Die plates are cut from solid steel blocks. *The Cleveland Automatic Machine Co.*

CIRCLE NO. 34, PAGE 13-14

Vacuum direct reading spectrometer for rapid analysis of five principal elements in steel is called Quantovac. The analyses are recorded in ink on paper for permanent record. *Applied Research Laboratories.*

CIRCLE NO. 35, PAGE 13-14

Air operated tape dispenser is available in four models for all types of pressure sensitive tapes. Removal of tape puts next delivery cycle in motion. *Air Fixtures Inc.*

CIRCLE NO. 36, PAGE 13-14

Automatic monitoring and control of temperatures is performed with thermocouple sensors. Unit comes in 10 ranges of temperature controlling within two per cent of dial settings. It is available in single or multi-meter models. *Tipp Manufacturing Co.*

CIRCLE NO. 37, PAGE 13-14

Gun shot mix for patching cupolas is known as Silicamix. When applied under water and air pressure is said to readily adhere to walls keeping "drop" to a minimum. Each pellet

CIRCLE NO. 129, PAGE 13-14

contains its own bonding material. *Silica Chemicals, Inc.*
CIRCLE NO. 38, PAGE 13-14

Portable Isotope radiograph machine may be used to detect flaws in castings. The Multitron employs radiation from a 50 curie cobalt-60 source

is claimed to do same job as 2 million volt X-ray machine. It is self-contained and needs no power supply. *The Budd Company.*
CIRCLE NO. 39, PAGE 13-14

Visual inspection of non-porous materials for detecting surface flaws made possible with Dyeline. Dye and detector will reveal cracks as small as 0.0002 in two min. *Zaco Laboratories Div., Zip Abrasive Company.*
CIRCLE NO. 40, PAGE 13-14

Hydraulic press, 500 ton, requires less than four foot square floor space. Its closing speed is eight sec and

opening speed is six sec. Press need not be bolted to floor. *Electric Steel Foundry Company.*
CIRCLE NO. 41, PAGE 13-14

Filter respirator weighing six oz with headband and has aluminum face

CIRCLE NO. 130, PAGE 13-14

piece and neoprene sponge cushion. Ultra-Filters are easily changed. *Mine Safety Appliances Co.*

CIRCLE NO. 42, PAGE 13-14

Automatic retractable conveyor loader may be raised or lowered or made to any intermediate height or pitch by push button control. Travel speed may be synchronized with plant conveyor. *Lance Iron Works.*

CIRCLE NO. 43, PAGE 13-14

Masonry cutting blade model BD-135-3 has a 5/16 in. deep diamond rim for longer blade life. Recommended for glazed tile and highly vitrified masonry materials. *Eveready BrikSaw Company.*

CIRCLE NO. 44, PAGE 13-14

Solvent detergent is designed to remove oil and grease where water can not be used and for electrical equipment. No rinse is necessary; parts may be blown dry with compressed air. *Oakite Products, Inc.*

CIRCLE NO. 45, PAGE 13-14

Lead holder for draftsmen has spring-loaded release mechanism and hardened steel clutch which is self-cleaning. Barrel is of annodized aluminum. *Richard Best Pencil Company.*

CIRCLE NO. 46, PAGE 13-14

Steel Properties

British work on the low and medium carbon steels has confirmed that for the purpose of developing the best low temperature impact properties, castings should be normalized following a full annealing treatment. If only a single heat treatment is to be applied normalized material has been shown to give markedly better properties than material in the fully annealed condition.

Aids for Small Businessman

A permanent file of 52 management aids bound in two volumes is now available for the small businessman. The articles are grouped into sections on business-government relations, internal general management, and external source of help, advice and guidance. These volumes may be purchased from the Superintendent of Documents, Washington 25, D.C. Volume 1 is priced at 65 cents, Volume 2 at 55 cents.

Graphite Just One Line Of Active African Firm

The graphite used in your foundry may be produced by an unusual East Africa firm whose motto is "Dealers and stockists of everything." Activities include importing, exporting, wholesaling, retailing, mining and acting as manufacturers representatives.

Shah Vershi Devshi & Co., Ltd., is located in Thika, Kenya Colony, South Africa. Its activities started in 1919 and until 1925 was little more than a trading center catering to the African trade. Now its activities have expanded into various unrelated lines and branches are maintained at Nairobi, Ruiru and Ol Donyo Sabuk.

One of its most successful activities is a brewery completed in 1954. It also acts as agent for a number of wines, spirits and liquors and operates a 300-seat capacity movie theater.

In 1950 it acquired a graphite mine and currently is producing about 25 tons monthly and exporting throughout the world. The deposit is roughly 3000 ft long and 100 ft deep and estimated to contain about 100,000 tons of graphite. The graphite is found in veins alternating with sandstone bands.

The ore is first passed through jaw crushers, then roller crushers and then screened. A rough concentrate is obtained by flotation. It is then dried, polished and screened and finally blended. The carbon content of the graphite ranges from 97-98 per cent for lubricants to 65-70 per cent for other uses.

Group Seeks Apprentices

The Northern California Chapter of the American Foundymen's Society has established an apprentice committee to help provide more molders and coremakers. Efforts are being made to supply a list of apprentice applicants and to set up a program whereby future applicants may be processed.

Emphasis is on men between 17 and 26 who are willing to serve a four-year apprentice program and are able to pass a related training program obtained through night school study.

let's get personal

Warner B. Bishop Jr. . . has succeeded L. P. Robinson as vice-president of Archer-Daniels-Midland Co.'s Foundry Products Division, Cleveland. Bishop has served as manager of exports, assistant sales manager, and sales manager, and was elected assistant vice president in 1955. He is a graduate of Dartmouth College and received his Master's degree from the Amos Tuck School of Business Administration in 1942. In 1955 he attended the advanced management program at Harvard University.

Donald E. Matthieu . . has resigned as district manager, Kerchner, Marshall & Co., to accept a new post as assistant to president of Richmond Foundry & Mfg. Co., Richmond, Va. Matthieu is now serving as secretary of the southern section of the Chesapeake Chapter, AFS.

General Electric Co. has appointed **George M. Hartley** as market manager of the Metallurgical Products Dept. **Norman A. Matthews** has joined the department as research engineer in connection with advance development.

Clyde E. McQuiston . . quality control manager at Advance Foundry Co., Dayton, Ohio, recently received his Doctorate for foundry work in industrial engineering. His paper, "Influence of Sand Grain Distribution and Related Variables on Green Sand Casting Finish" will be presented in part at the 1957 AFS Convention in Cincinnati.

Clyde B. Jenni . . chief metallurgist of General Steel Castings Corp., Eddystone, Pa., has started a six months' tour as Chief of the Castings Branch of the Iron and Steel Division, Business and Defense Services Administration, Department of Commerce. He succeeds Roger F. Waindle who has just completed his six months' tour. Jenni serves on technical committees of AFS, SFSA, ASME, ASTM, and is Industrial Coordinator of the Metallurgical Advisory Committee on Cast Armor.

D. L. LaVelle . . new assistant product manager, Pig & Ingot Dept., Kaiser Aluminum & Chemical Sales, Inc., Chicago, has moved to the midwest from his previous post with Federated Metals Div., American Smelting and Refining Co. He has been active in metal working societies and recently was elected chairman of the Light Metals Division of the American Foundryman's Society.

Appointments in the sales department of Electro Metallurgical Co., Division of Union Carbide and Carbon Corp., include the following: **J. C. Moroso** is named assistant to the general sales manager, **D. B. Reeder** is named

D. E. Matthieu

W. B. Bishop, Jr

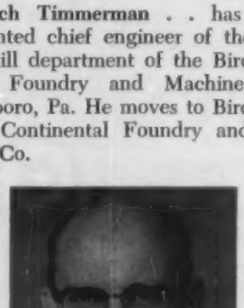
D. L. LaVelle

western manager of metallurgical service, **S. L. Jackson** is named New York district manager, **F. W. Hanson** is named Houston district sales engineer, and **W. R. Fiand** is named a sales and service representative for the firms Pittsburgh district office.

J. H. Kauffman

The foundry engineering department of National Engineering Co., Chicago, has added two men to its staff: **John H. Kauffman** and **Clarence C. Roarick.** Kauffman comes to National as assistant chief engineer. He was formerly foundry engineer for Studebaker Corp. Roarick will serve as foundry engineer for National. He was formerly vice-president in charge of manufacturing and engineering for the Mueller Co., Decatur, Ill.

Dietrich Timmerman . . has been appointed chief engineer of the rolling mill department of the Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa. He moves to Birdsboro from Continental Foundry and Machine Co.



C. C. Roarick

General Motors Institute has awarded Bachelor of Science degrees to eleven men from GM's Central Foundry Division. Graduates are: **Arthur M. Carson, James E. Wheeler, Robert E. Hackler, Arthur G. Finet,** and **Robert A. Seybold,** of the Danville plant. From the Saginaw plant came **Robert E. Elsea, L. T. Soblesky, Jerald E. Hanes,** and **James E. Jackson. Her-**

bert G. Bunke and **Michael J. Tahy** were graduates from the Defiance plant.

Carl H. Beverly . . has been elected treasurer of the Fanner Mfg. Co., Cleveland, Ohio. He joined the Fanner organization in February, 1956 as treasurer of the Cleveland Hobbing Machine Co.

A. T. Lillegren

Austin T. Lillegren . . vice-president of Madison-Kipp Corp., Madison, Wis., has been awarded the Doehler Award by the American Die Casting Institute for his contributions to the die casting industry.

Archer-Daniels-Midland Co., Cleveland, announces the appointment of **W. C. Kremer** as Chicago manager, Foundry Products Division. He joined the company in 1941 and has been with the Chicago office since 1946. He succeeds **J. C. Gore.** Gore retired in August after having been in the foundry business for 49 years. He was president of the AFS Chicago chapter 1945-46.

W. E. Dolan . . is celebrating his 50th year as a member of AFS. He spent 65 years in the industry: 10 as an apprentice and mechanic, 55 as foreman and supervisor. Retired since 1948, he still attends the AFS Castings Congresses and has missed only one in the long history of the society.

William W. Goessel . . has been named foundry division superintendent of the Beloit Eastern Corp., Downington, Pa. He was previously associated with Beloit Iron Works at Beloit, Wis.

Herbert von Wolff . . has been named general sales manager of Shalco Eng. Corp. He has also been elected to a vice-presidency with the firm.

Norton Co. has created three new divisions in a reorganization. Newly

formed divisions and their executive officers are: abrasive division, **John Jeppson**; refractories division, **W. G. Fallon**; electro-chemical division, **H. J. Daly**.

Francis D. Lordi . . has been appointed development engineer in General Electric Co.'s Foundry Department Applied Research and Development Laboratory. Graduate of Columbia University, Lordi joined GE in 1951.

Executive changes at E. W. Bliss Co.'s Mackintosh-Hemphill Div. move **J. A. Lindberg** to post as manager of manufacturing operations while **T. H. Pattison** becomes manager of the organization's Pittsburgh plant.

Baker-Raulang Co., Cleveland, has named **Ralph C. Reinhart** director of manufacturing and has appointed **Robert J. Laws** as assistant chief engineer.

John Hellstrom . . vice-president of American Air Filter Co., Inc., has acquired administrative control of the American Air Division of the company in addition to his other responsibilities.

Robert P. Sayers . . has been appointed as manager of the Duluth, Minn., office of Link-Belt Co.

Malcolm Petrie . . is now assistant sales manager for Shell Process, Inc., West Springfield, Mass.

David E. Neustadt . . is now vice-president and marketing director for National Metal Abrasive Co., having recently resigned as general sales manager of W. W. Sly Mfg. Co.

Alden P. Edson . . has joined the staff of the New England Technical Field Section of the International Nickel Co.'s Development and Research Division.

Lloyd A. Dixon, Jr. . . has been appointed West Coast sales manager of Houghton Laboratories, Inc.

Ralph C. Hanson . . has moved from E. J. Lavino & Co. to the Ramtite Co.'s Pittsburgh office as a special representative.

John L. Martin . . president of Martin Equip. Co., Wabash, Ind., has been honored by the alumni magazine of his alma mater, Notre Dame.

E. B. Germany . . president of Lone Star Steel Co., Dallas, Tex. has accepted a five year contract to con-

tinue in that position. He has held that office for the past nine years.

John Strother . . is regional manager of seven East South Central and South Atlantic states for All-State Welding Alloys Co., White Plains, N. Y.

A. M. Luntz . . president of Luntz Iron and Steel Co., Canton and Cleveland, has been awarded the 1957 National Human Relations Award of the National Conference of Christians and Jews.

Richard R. Kesti . . has been named chief engineer of both Valvair Corp. and Sinclair-Collins Valve Co.

Hansell-Elcock Co., . . Chicago, has named **Lawrence Kick** as coreroom foreman. **Stanley Wozniak** has been superintendent since April.

Louis Dill . . has been named to the new post of merchandising manager of George F. Pettinos, Inc., Philadelphia.

George C. Wilsher . . has been named vice-president in charge of engineering for Holcroft & Co., Detroit, manufacturers of heat treating furnaces.

John P. Bank . . has been appointed sales engineer of the Thor Power Tool Co., Aurora, Ill.

John L. Drogas . . has joined the sales department of Weldaloy Products Co., Van Dyke, Mich.

Allen M. Harrelson . . is now vice-president and treasurer of H. K. Porter Co., Inc.

F. E. Pringle . . has moved into new post as assistant general sales manager for Howe Scale Co., Rutland, Vermont.

John P. Holt . . has been named executive assistant to the sales v-p of Basic Incorporated, Cleveland.

Looking . . .

. . . for new production ideas? Circle numbers on Reader Service cards (page 13-14) to get more information on products and services described in Products & Processes and For the Asking.

Who put the "Imp" in impellers?

...or how Chuck Wright turns the heat on chill

Pat Kelly, over at Avis Foundry, was casting pump impellers that came back from the machine shop almost as fast as he sent them over. The trouble? Chilled edges.

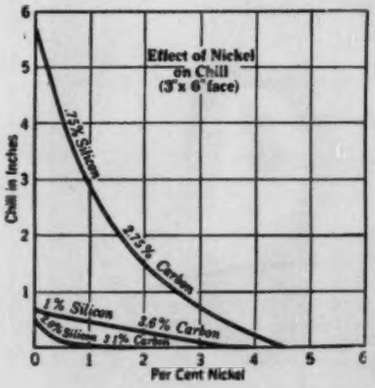
The machine shop, and the front office, too, beefed plenty. Chilled iron always means slow machining speeds, excessive tool wear and poor finish.

Pat noticed chilled edges on the first pieces poured. He increased the silicon in his mix to reduce chill. But this gave him open grained weak iron in the heavy hubs.

His foundry practice was tops. Molding, cores, temperature and so on couldn't be criticized. The trouble, however, was in another place. Pat's order called for castings that had sections varying, in the same casting, from 3/16" to 1½". And that was the rub.

High silicon reduces chilling tendency in thin sections, but results in opened grained, porous thick sections.

From my notebook, I gave Pat this graph illustrating the effects of nickel on chill.



You'll find, just as Pat did, that a little nickel is your best friend whenever you need dense, pressure-tight heavy sections along with strong, yet machinable lighter sections.

The boys at Avis now pour pump impellers in an iron of some 3.25% carbon, 2.30% silicon, and .75-1.00% nickel. Light sections permit high speed machining operations, because chill in the nickel iron is absent. What's more, there's a big saving from the new low finishing costs.

You can get rid of chills . . . and headaches, too . . . with a little nickel. But whether you use nickel or not, whenever you meet up with a difficulty involving the metallurgy of castings, get in touch with me. The easiest way to reach me is through INCO.

Chuck Wright

INCO TRADE MARK

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

Stress Role of Research At Steel Founders' Meeting

Research was the principal theme of the 54th annual fall meeting of the Steel Founders' Society of America at the Greenbrier, White Sulphur Springs, W. Va., late in September. More than 300 persons, the largest number to date, attended the two-day meeting presided over by President Howard F. Park, Jr., vice-president, General Steel Castings Co.

Europe's comeback in the castings industry was described by

Howard F. Park, Jr.

Charles W. Briggs, S.F.S.A. technical and research director, who attended the International Foundry Congress at Dusseldorf, Germany. Much of German progress, he said was due to Marshall Plan Aid. Briggs stated that in Europe emphasis is given toward maximum quality in soundness with lesser attention given to finish. Extensive machine shop facilities are maintained by foundries to permit full machining of castings prior to shipping and to further control quality. European foundries are hoping to increase their exports and Briggs cited the Dusseldorf show as an excellent example of their aim to publicize their achievements.

"Growth Through Research" was discussed by Fred W. Manley, Minnesota Mining & Manufacturing Co., who stated that his company's annual research budget is now $11 million. Product and production research must operate cooperatively, not separately, to achieve maximum results, he said.

Starting the second day's activities was a session on progress in

market research. F. Kermit Donaldson, Society executive vice-president, discussed the S.F.S.A. marketing survey which was recently completed. Some facts revealed by the survey are contrary to popular thinking within the industry, he said.

Allen M. Slichter, president of The Pelton Steel Casting Co., and chairman of the market research committee, spoke on *"The Promise of Market Research."* He said that the economic side of market research generally charts the growth of markets as related to populations

Fred W. Manley

while a second side deals with individual industries and their programs in relation to the overall economic pattern.

The related market research work on the part of other industries and its effect on the steel castings industry will be of great value in the forming of sales programs, he said.

America's highway building program, referred to as the biggest single peace-time undertaking of man, was discussed by Kenneth Lindsay, executive vice-president, Iowa Manufacturing Corp., and president of Construction Machinery Industry Association. He said that this program will have a considerable effect on the castings market with the greater useage not only of trucks, buses and autos but also with items used by basic transportation industries such as railroads, steamships and barge lines.

The closing session was addressed by E. C. Huebner, Wehr Steel Co., chairman of the Society's safety committee. He and President Park presented the annual safety awards.

Continued from page 5

and completed the larger ones are dried in a portable direct gas-fired heater and blower and the smaller molds are placed in a special oven. The cores are baked in a convection-heated oven with a gas-fired air heater and a recirculating fan. Automatic instruments are used for close temperature control.

Contour lining has been a daily standard procedure since 1945. (Fig. 1). The cupola inside diameter is measured at specified levels from the well to the stack and the data used in calculating the volume of the melt and stack zones. The required contour is applied by Gunite type equipment blowing semi-fluid refractory material. The resulting contour ranges from 57 in. at the widest point in the melt zone to 48 in. at the well.

In starting the melt, which averages 2000 lb, the first coke charge is placed on wood supports and lit by three gas torches inserted through the tuyeres openings. After 15 min these are turned off and the air blower operated for 15 min. This is followed by a two-hour soaking period, the drop in coke height is measured and additions made. The remaining metal, flux, and then coke is added to complete the melt charge.

Advance Foundry feels that this method produces a more uniform

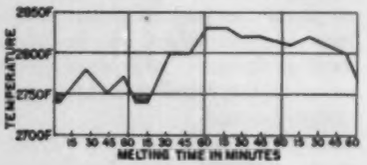


Fig. 2 Daily tapping log.

melt as the base coke is white hot before the metal charge melts and droplets start to form. Cupola instruments include an air meter for controlling air through tuyeres and these readings as well as back pressure are recorded and indicated. Dry and wet bulb temperatures are recorded to calculate the amount of carbon pick up due to moisture.

Daily records of the melting department include: the cupola report which logs the charge of materials and iron produced; the production record which details the type and

Continued on page 53

the editor's field report

by J. H. Schaum

♦ **New Nodular Iron Process:** If you missed the ASM Convention in Cleveland last month you may be unaware of the new nodular iron process announced there by the Allis-Chalmers Mfg. Co. A paper presented by H. K. Ihrig, Research Metallurgist, revealed that cupola iron is being nodulized on a commercial scale by adding in the ladle a mixture of sodium and magnesium chlorides with calcium silicide as a reducing agent. In the presence of molten iron the calcium combines with the chloride and reduces the sodium and magnesium to their metallic form in atomic fineness. In this form they are quietly and quickly absorbed with no violent explosive reaction. For more details of this imaginative and promising procedure consult the article covering the process in this issue of MODERN CASTINGS.

♦ **British Dust Collector:** Herb Weber, our AFS director of SH&AP, has just brought to my attention an unusual wet dust collector, called the Solivore-Titan, manufactured by the Constructional Engineering Company of Birmingham, England. The manufacturer claims that the collector will effectively remove particles as small as 0.1 micron and on blast furnace installations has removed 99.9 *per cent* of the dust with a mean diameter of 0.3 *micron*. Foundrymen will be interested to know that this unique collector, utilizing a fine mist of water and a venturi effect, can be used on cupolas as well as electric and open hearth furnaces. Weber says, "If their figures hold in practice, the Solivore-Titan compares with or exceeds the performance of the most efficient collectors in the United States."

♦ **Stroboradiography:** Some of the problems associated with studying fluid flow of molten metals may be solved by new stroboradiographic equipment. Developed by the Detroit Arsenal and General Electric Co., this device makes it possible to see through a motor block and record the actions of internal moving parts. Employing X-rays from a high energy betatron at 5 to 15 million volts, high speed motion pictures can be taken with exposure times of 10 to 15 millionths of a second. Since X-rays can see through sand and molten metal, why not project this technique to the study of metal flow through gating systems and turbulence within the mold cavity? I also foresee possibilities of recording on film such heretofore invisible phenomena as the formation of internal shrinkage cavities, the liberation of gases, and the transformation from liquid to solid state. Of course, these gimmicks don't come cheap. In fact, $300,000 would probably just about cover the cost of equipment and special building to house it.

♦ **Never underestimate the ability of the youth of America:** The current rock-and-roll generation has once again displayed amazing talents in the Ford Motor Company Annual Industrial Arts Awards and Student Craftsman's Fair. I have just been privileged to view the exhibit of prize winning entries selected from over 40,000 projects and am happy to say that the foundry arts were well represented. Of particular interest was a panel displaying all the

drawings, wooden patterns, core boxes, and aluminum castings made for constructing a four-cycle single cylinder, 1.53 cubic inch displacement model airplane engine. A lad of 18, Leo Aho of West Technical School in Cleveland, Ohio, received an Outstanding Achievement Award for this unusual undertaking which is pictured below. So it won't be long until our current "Do-It-Yourself" generation will be replaced by its "We-Can-Do-It-Better" offspring.

AFS Chapters Elect

Additional chapters of the American Foundrymen's Society have announced the election of new officers. These are:

Birmingham

Chairman: John F. Drenning, Kerchner Marshall & Co., Birmingham, Ala.

Vice-Chairman: Sam F. Carter, Jr., American Cast Iron Pipe Co., Birmingham, Ala.

Secretary: Lloyd L. Stone, Stockham Valves & Fittings, Birmingham, Ala.

Treasurer: T. L. Turner, Southern Wheel Div., American Brake Shoe Co., Birmingham, Ala.

Directors: W. K. Bach, Foundry Service Co., Birmingham, Ala.; Henry Guthrie, DeBardeleben Coal Corp., Birmingham, Ala.; A. B. Schwarzkopf, U. S. Pipe & Foundry Co., Bessemer, Ala.

Aubrey M. Garrison, Jr., 809 Protective Life Bldg, Birmingham, Ala. is the membership chairman.

Central Illinois

Chairman: Kenneth M. Smith, Caterpillar Tractor Co., Peoria, Ill.

Vice-Chairman: Gilbert F. Lloyd, Brass Foundry Co., Peoria, Ill.

Secretary-Treasurer: W. Lawrence Kinsinger, Caterpillar Tractor Co., Peoria, Ill.

Directors: Clarence J. Turner, Caterpillar Tractor Co., Peoria, Ill.; Lawrence W. Winings, Wagner Malleable Iron Co., Decatur, Ill.

Ralph T. Brower, Caterpillar Tractor Co., is the membership chairman.

Central New York

Chairman: William A. Mader, Oberdorfer Foundries, Inc., Syracuse, N. Y.

Vice-Chairman: N. W. Meloon, Jr., Meloon Bronze Foundry, Inc., Syracuse, N. Y.

Secretary: Ralph J. Denton, R. J. Denton Co., Inc., Syracuse, N. Y.

Treasurer: Bruce R. Artz, Pangborn Corp., Syracuse, N. Y.

Directors: Donald C. Brainard, Dayton Oil Co., Dayton, Ohio; Cecil L. Sims, Sims Match Plate Corp., Syracuse, N. Y.; Lewis A. Balduzzi, Oberdorfer Foundries, Inc., Syracuse, N. Y.

Ralph J. Denton, 140 Dickerson St., Syracuse, N. Y. is the membership chairman.

Chesapeake

Chairman: Lewis H. Gross, American Standard Corp., Baltimore, Md.

Secretary: William S. Crisp, Gibson & Kirk Co., Baltimore, Md.

Treasurer: H. M. Witmyer, Foundry

Service & Supply Co., Baltimore, Md.

Directors: J. Scott Parrish, Jr., Richmond Foundry & Machine Co., Richmond, Va.; Eugene H. Ryer, James J. Lacy Co., Baltimore, Md.

S. Donald D'Alfonso, 5801 Baltimore National Pike, Catonsville, Md., is the membership chairman.

Chicago

Chairman: Robert P. Schauss, Werner G. Smith, Inc., Chicago.

Vice-Chairman: W. O. McFatridge, International Havester Co., Chicago.

Secretary: Harold L. Overman, Whiting Corp., Chicago.

Treasurer: Louis J. Jacobs, The S. Obermayer Co., Chicago.

Directors: E. W. Greenlees, Kensington Steel Co., Chicago; James T. Moore, Wells Mfg., Skokie, Ill.; D. G. Schmidt, H. Kramer & Co., Chicago; Roy W. Schroeder, University of Illinois, Navy Pier, Chicago.

Donald G. Schmidt, 1339 W. 21st St., Chicago, is the membership chairman.

Cincinnati

Chairman: R. J. Westendorf, Dayton Casting Co., Dayton, Ohio.

Vice-Chairman: E. J. James, The Dayton Oil Co., Dayton, Ohio.

Secretary: Robert Thompson, The H. P. Deuscher Co., Hamilton, Ohio.

Treasurer: Arthur G. Jones, Aro Equipment Corp., Bryan, Ohio.

Directors: Robert E. Webb, Tri State Foundry Co., Cincinnati; Roland C. Schwartz, H. Kramer and Co., Cincinnati; William R. Oakley, Delhi Foundry Sand Co., Cincinnati; Maurice G. Bolinger, Wm. Powell Co., Cincinnati; Edward H. King, Hill and Griffith Co., Cincinnati.

Milton E. Johnson, 3181 Linwood Rd., Cincinnati, is the membership chairman.

Eastern New York

Chairman: Alexander C. Andrew, Adirondack Foundries & Steel, Inc., Watervliet, N. Y.

Vice-Chairman: Louis J. Di Nuzzo, General Electric Co., Schenectady, N. Y.

Secretary-Treasurer: Peter E. Noonan, Albany Car Wheel Co. Inc., Albany, N. Y.

Directors: Fred Ziter, Adirondack Foundries & Steel, Inc., Watervliet, N. Y.; Theodore O. Carlson, General Electric Co., Schenectady, N. Y.; R. N. Williams, George F. Pettinos, Inc., Granville, N. Y.

William C. Stevenson, Renssalaer Valve Co., Cohoes, N. Y. is the membership chairman.

Continued on page 56

ternational Congress entered in cluster of uildings shown above, cluding Hall P (right) hich housed castings.

CASTINGS EXHIBITS

Dusseldorf Congress helps promote European foundry industry by magnificent exhibition of castings

By Harry Dietert
icial Delegate of AFS and f Official Exchange Paper, ational Castings Congress

Visitors from all over the world who attended the **International** Foundry Congress and the associated International Foundry Trade Fair at Dusseldorf, Germany, the first nine days of September were dazzled by what was probably the largest and most spectacular group of foundry exhibits ever assembled.

It was the largest such show in area covered, largest in scope and largest in attendance. An estimated 180,000 persons visited the Congress and the Fair, of whom probably 12,000 were foundrymen.

The Congress was essentially three major shows—an equipment and materials exhibit; a die-casting exhibit, and a foundry products exhibit.

By far the most spectacular was the foundry products exhibit which drew buyers of castings from all over Europe. It was designed to do exactly what the forthcoming AFS Castings Congress to be held next Spring in Cincinnati is designed to do—bring the makers, the designers and the buyers of castings together. And like the AFS Castings Congress, the theme of a good portion of the technical program was "Design and Casting."

The exhibits of castings were magnificent. Besides outdoor exhibits and miscellaneous exhibits in other buildings, an entire building of 120,000 sq ft was devoted solely to showing castings. This was the most impressive exhibit of any kind I have ever seen.

Modern exhibit design made the entire interior of the building look like a single unit. This was accomplished in part by careful harmonizing of colors and eliminating booth dividers and signs at right angles to the wide aisles. One could walk into any booth without hindrance. As far as one could see there were castings of all sizes.

Large castings were grouped in centers away from the entrance and smaller castings were near the front. Pastel and bright colors were carefully planned to make a tremendously attractive exhibit.

This exhibit really glorified castings. The booths were beautiful. You could have exhibited mink coats in that hall and your booth would not have been out of place. The whole affair was conducted with dignity and taste.

I was particularly impressed by several exhibits which showed exploded views of such assemblies as tractors and outboard motors, with the cast parts separated from each other by transparent plastic. They just seemed to be sitting out there in the air. Castings shown ranged from 25 tons to less than an ounce.

The main castings display structure, Hall P, contained castings of steel, gray iron, malleable iron and nodular iron.

Non-ferrous castings and die castings, together with die casting machines occupied another building.

Altogether, the castings congress occupied an outdoor area plus six large buildings. One was a three-story structure with escalators. Generally each building contained one particular type of exhibit.

The educational exhibits were extensive and impressive. They covered around 20,000 sq ft and included an actual operating foundry and pattern shop, including chemical laboratory, drafting room, pattern layout, rigging of patterns and flasks. They were manned by students and drew large crowds.

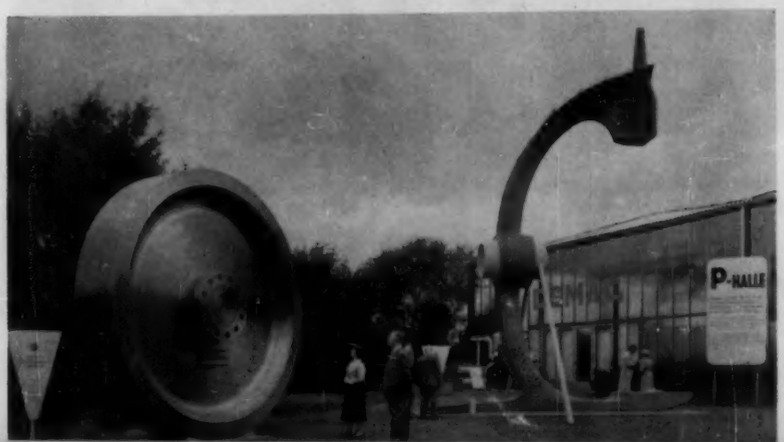
A technical display section showed the structures of metals in great detail, with a number of graphic and complicated diagrams. Another exhibit showed the history of castings. Neither of these latter two seemed to draw the crowds that the other exhibits did.

American exhibitors included Beardsley & Piper; the German division of Doehler-Jarvis and of

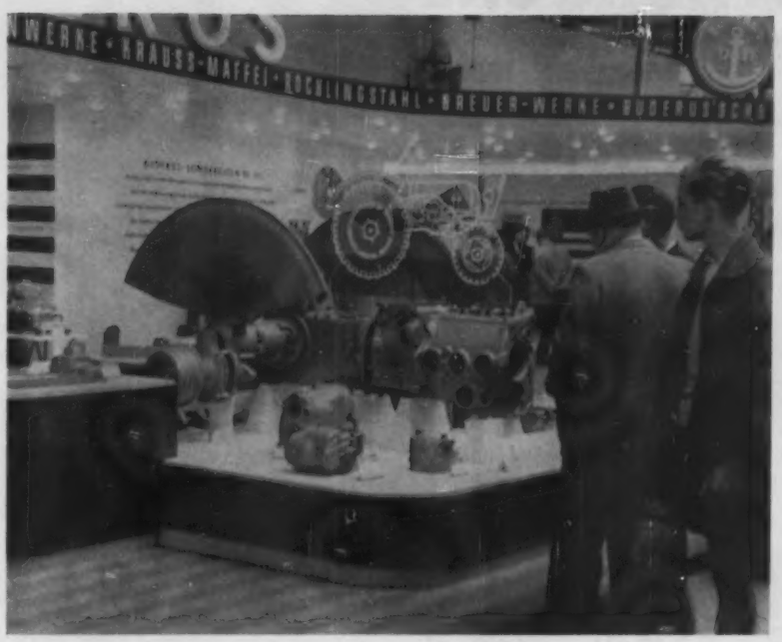
Entrance was between carillon exhibit and a 250-ton casting.

Castings too large for hall were displayed on outside.

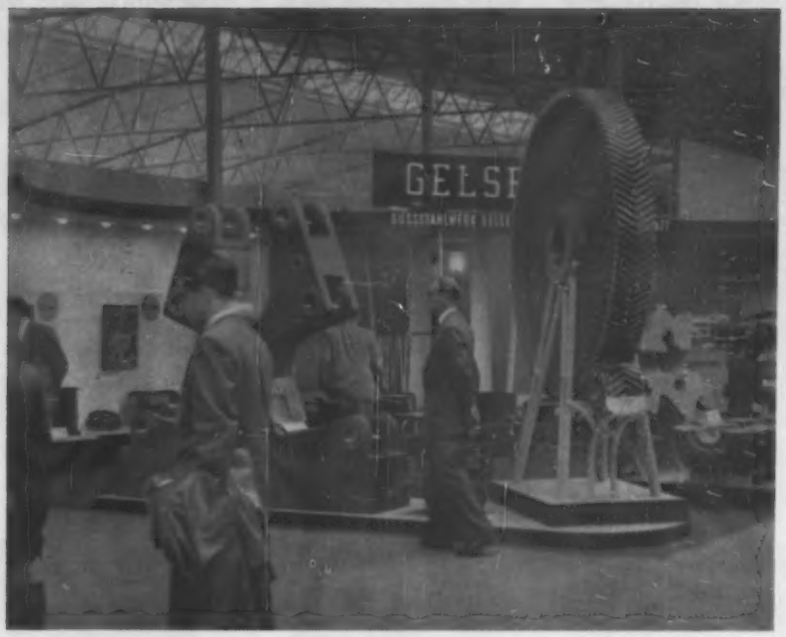
Showing of 60-ton flywheel and 22-ton ship's frame helped promote German foundries. AFS Congress next spring is aimed at same goal.



DOMINATE INTERNATIONAL SHOW



Handsome booth shows care Germans used to design castings displays.



Booths were integrated into an overall display plan as a unit.

Redford Iron and Equipment Company; Harry W. Dietert Company through Roncerary of Paris, France, and the Simpson line of mixers through Georg Fischer, Ltd.

The technical program at the Congress consisted of 26 technical papers, all in preprint form, which were available on arrival. There were also 10 short lectures on castings design held during a single day.

Most question periods were very limited and there was no record of the discussion. Average attendance at the meetings was about 450 persons, though one or two had as many as 1,000. There were never more than two meetings at a time and their hours were 9 a.m. to 1 p.m. and 2:30 p.m. to 5 p.m.

I have a feeling that the technical sessions themselves were not as well managed as those of AFS. However, the lectures were given in three languages with individual ear phones and plugs so that a listener could hear the lecture in German, French or English. The projection equipment was good.

First In 20 Years

■ One of the factors that permitted the Dusseldorf show to be so successful is the fact that it is the first castings congress to be held in Germany in 20 years. Much of the money for financing it came from taxes placed on the industry over the years. In all, some 250,000 DM were collected, which is equal to $60,000 but will do the work of perhaps $180,000 in the United States. In addition, of course, the display space was sold and this revenue helped finance the show.

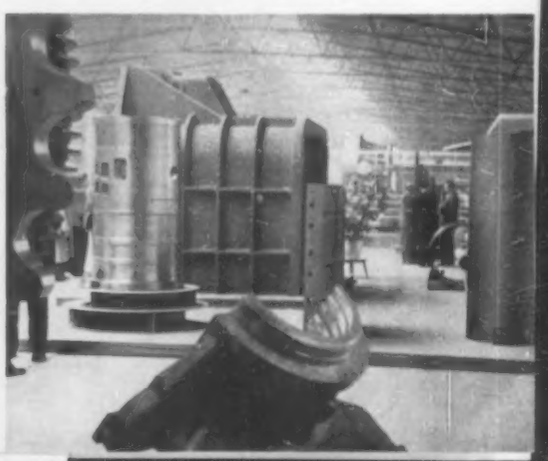
The three main groups sponsoring the show—the equipment group, foundry group and die casting group—employed a single commercial company that handles all such shows in Dusseldorf.

While the exhibits were outstanding I did not feel that the castings themselves were superior to ours.

British observers confirmed author's feeling that the exhibition was greatest ever held.

Turbine wheels, cylinders, pipes typified some of thousands of castings being shown.

Big castings helped buyers get better idea of foundry industry.



IT WAS REALLY THREE SHOWS IN ONE

Besides the Germans, castings exhibits were shown by the French, Swiss and Czechs.

The castings generally were of good quality. The grain structures tend to be more open than ours since our castings seem to be denser. Their casting finish is good but does not excel ours. The Czech castings seemed to be dirty and of poorer quality than the others shown.

The patterns and core boxes I saw showed greater craftsmanship than I find in the United States. Their design tends to be a little more massive than ours but not much different.

This exhibit attracted castings buyers from all over Europe. In addition it helped instruct 180,000 lay persons on castings and on the foundry process. These people came in from all over, whole bus loads of them, to see the exhibits. They would bring their families, children and all, and pay the 1½ DM admission price.

The manner of selling was extremely interesting. No direct sales pitch was given. They would have been shocked to talk business. The booths were always full of people and most of the booths served refreshments of some kind, coffee, tea, coke, or liquor. The exhibitors talked with prospects on a basis of friendship only. It was carried on with great dignity.

You would go into a booth, introduce yourself, and talk about various matters for say a half hour. Even then no sales approach would be made. It was simply a place to get acquainted, to make friends. They believe in selling castings on a basis of friendship. It is a sales method that might be used more profitably by some businesses in this country. It was even difficult to get literature. It is put away in a drawer some place and takes a long time to find. On a couple of instances when I was in a hurry and asked for literature I got the impression that my hosts were scandalized.

But the net result of all this is that the Germans are selling their castings everywhere. They are exporting heavily and cutting into the French, Swiss and British markets. Their prices are also low despite relatively high wages. Their production apparently has increased with constantly better efficiency.

Equipment Trends

■ The equipment and materials portion of the exhibit was not as outstanding as the castings exhibits. Nevertheless there are a lot of developments going on in Europe that any American foundryman will find interesting.

One that interested me the most, perhaps, is an apparent trend away from large expensive automatic molding machines to fast efficient smaller machines operated by one or two men. They are jolt-squeeze-flask lift machines and all the operator has to do is remove sand from the top of the flask and handle the flask.

There was a large number of mullers, slingers, and sand testing machines which apparently have been copied from American equipment. The Europeans, especially the Germans, seem to be hunting for gadgets and attachments to put

Exhibitor Karl Schmidt makes all kinds of light metal products, iron castings.

Centrifugal and other casting displays offer ideas to new exhibitors planning to show at Cincinnati Congress.

Die-cast motor block was supplied by Doehler's main plant in United States.

Non-ferrous and die castings were important part of show. They occupied a separate building.

Educational exhibit was tremendous and attracted large crowds of holidaying visitors.

CONGRESS DREW 180,000 VISITORS

Laymen came in droves, learned about the castings industry and its many products.

Author, second from right, poses with Indian delegates from the Tata Steel Works.

Foundry machinery made up another section of the Dusseldorf Congress.

on these machines to give them a sales advantage.

There were four complete molding units in operation there.

I was surprised to note very little shell molding—apparently because of the high royalty charges they must pay. There was also little CO_2 equipment, though it originated there. We are moving faster and have better methods than they have in both of these fields and certainly we have better shell equipment. There were two automatic CO_2 machines which blow and gas-set cores. I noted that the CO_2 cores did not have hard edges and scuffed easily. Apparently this is a universal problem. I heard much about the need for an additional binder to be used with the sodium silicate. I also heard that such a binder would be patented soon in the United States by an Italian firm.

I was impressed by an additive that is mixed with cement sand to speed mold setting and permit the making and pouring of cement-bonded molds the same day.

The Germans seem to use core shooters primarily rather than core blowers but their core mixes are stiffer than ours and more adaptable to this method.

There was much talk of degassing metals in ladles and in the mold by vacuum methods and equipment was exhibited to accomplish this. Vacuum melting is also used for small heats in electric furnaces.

The automatic pouring of molds is another important new development. This is done by a machine which weighs the metal, pours it automatically at a scientifically controlled rate, and holds the spout at a constant height above the mold by a planetary system of mounting.

One unusual installation I visited used central sand processing for various foundries or molding stations. At first I thought this wasted transportation compared with our system of processing the sand at each molding station, but after watching a sand processing unit in operation for a big foundry I think it has advantages which may offset the transportation cost. The biggest advantage is that it permits one skilled staff to control all incoming and outgoing sand, allows standardization and encourages employment of higher caliber sand personnel.

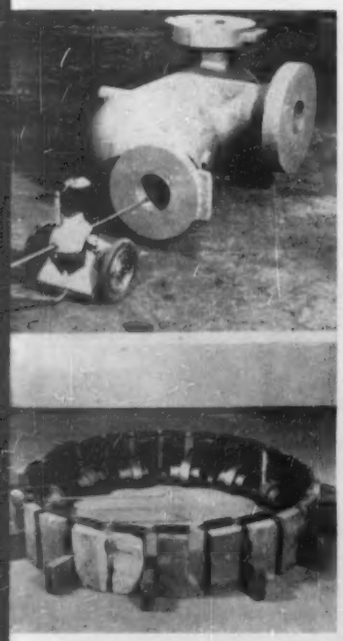
Other developments worth noting include:

- A CO_2 binder that will harden in the air by taking CO_2 from the air. Suitable for small cores only.
- A vertical sand elevator made with a rubber belt on which rubber cleats are vulcanized in pairs. These cleats are folded together by V-pulleys to form rubber buckets.
- A core blower equipped with rotating table having three stations. One station blows cores, the second gases cores with CO_2, the third station operator removes core box and cores and replaces empty core box. Time cycle is seven seconds.
- Automatic sand slinger rams molds without operator moving head about.
- German treated bentonite which will produce a strong green sand with 1 per cent bentonite when mixed in a continuous sand mill equipped with rapid intermixing of bentonite and sand while being mulled.
- Conveyor belt with adjustable ratchet drive used for addition of sand additives.
- Small stationary sandslinger with drawer type arm for ramming small molds.

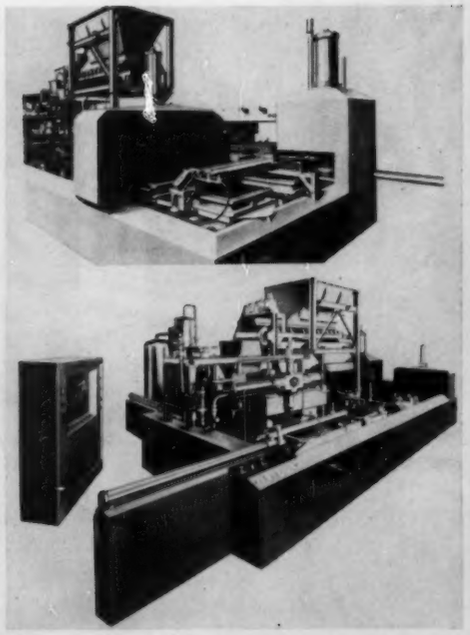
Die-casting machines were shown in group with die castings and nonferrous castings. These made up another of show's major sections.

EUROPE POOLS NEW EQUIPMENT IDEAS

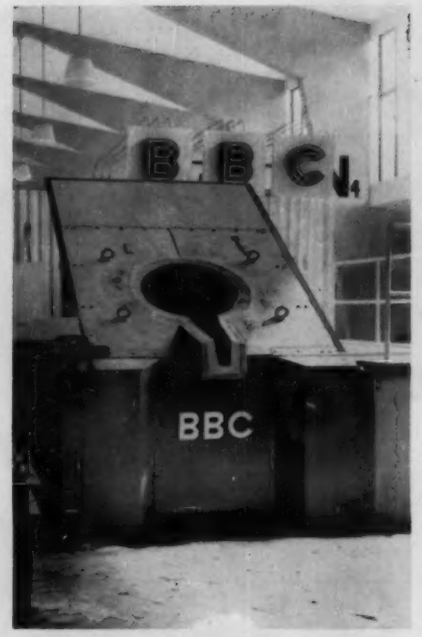
INTERNATIONAL CONGRESS



Castings are inspected by camera-ray equipment.



Die-casting machines drew interest. They are not shown at U.S. Congress.



Induction furnace was one of a number of electric melting units.

■ Large automatic molding machine of four-station type using exceptionally heavy cast flasks equipped with complete sand system and conveyor. Makes both copes and drags, closes molds, shakes out, returns flasks.

■ Semi-continuous casting of gray iron rods and pipes or tubes. Lengths from 4½ to 3 ft., diameter up to 4½ ft, from ¾ in. to 2-in. thickness. A water-cooled copper mold and core plug is used. Excellent life of mold or die is claimed. Hydraulic elevator feeds casting down through die as it solidifies. The ladle is tilted by a hydraulic table device. This machine makes tubes, pipes, cylinder liners, solid rods, and piston rings cut from tubes. No heat treatment is used. This machine has been running well for 1½ years.

■ A pre-cast, burned dolomite electric furnace lining in five segments, with a section the full height of the furnace. Saves labor and claims long life.

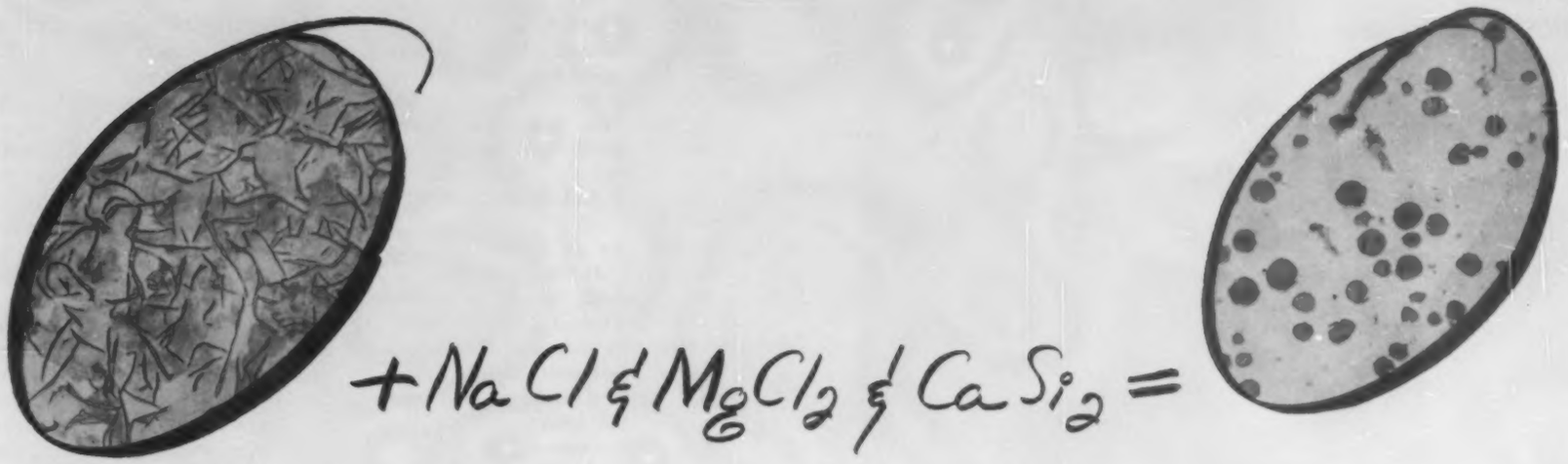
■ Vacuum electric furnace up to 3½ tons. For steel, Titanium, Chromium, and Ti-Fe-Chr alloy. Company will soon deliver a 500 cm. diameter vacuum furnace to a German steel company to cast high alloy steel bars for turbine blades for turbo-jet engines.

■ New exothermic for risers on steel castings. Produces more heat, needs no Williams core to break vacuum in riser. A powder charge in a plastic bag is added to the molten metal in the risers. As soon as the top of the riser begins to freeze a second charge is added and it melts the metal again. A reduction in number of risers required is claimed.

■ Resin-type binder that will harden in a day for molds. Can be used as a facing. Cores are hard, bake in two hours, and give good finish on castings.

Several operating sand systems were functioning during the show. This photograph was taken at a time when hall was clear of visitors.

Six-segment liner for electric furnace is made of burnt dolomite. Manufacturer claims it's easier installed and better than brick.



Allis-Chalmers Develops A New Nodular Iron Process

A revolutionary technique for making nodular iron was revealed by Harry K. Ihrig, research metallurgist for the Allis-Chalmers Mfg. Co., Milwaukee, at the 38th Annual Convention of the American Society of Metals in Cleveland.

The nodulizing reaction has been effected by adding a mixture of sodium and magnesium chlorides with calcium silicide as a reducing agent. According to Ihrig, in the presence of molten iron the calcium combines with the chloride, reducing the sodium and magnesium to their metallic form in atomic fineness. In this form they are quietly and quickly absorbed with no violent explosive reaction so typical of current practices involving additions of magnesium alloys. Because of this unusual solubility of reactive metals it is not dangerous to tap or pour iron directly on large quantities of the nodulizing agents.

Allis-Chalmers reports it has successfully projected this experimental technique into commercial practice using a 36-in. and 54-in. basic lined cupola. The basic cupolas have been growing in popularity because it is easier to produce in them the low sulfur content so vital for irons destined to be nodulized. Ductile iron castings produced in the firm's Milwaukee foundry by this new process range in size from a few pounds to over five tons. The technique is remarkably insensitive to the nature of the cupola charge. Whether the charge be all pig iron, mixtures of pig iron and nodular iron scrap, or straight steel scrap, the report says, the final product has been excellent.

Cupola iron with a tensile strength of only 16,000 psi at the spout was upgraded to 84,000 psi by this new treatment. Tensile strengths have approached 100,000 psi with yield points near 85,000 psi and elongation seldom under 10 per cent. All this plus good machineability is obtained without any need for heat treatment.

A further advantage pointed out by inventor Ihrig is that there is no undesirable build-up of alloying metals in the return scrap. In the case of nickel-magnesium or copper-magnesium addition agents sizeable quantities of nickel and copper are introduced to the base iron. These elements are not lost in subsequent remelting so they continue to accumulate in the home scrap every time it runs through the melting and casting cycle.

Ihrig emphasized the low residual magnesium content, below 0.03 per cent and often as little as 0.015 per cent, required to produce cast iron with graphite in the nodular condition. Other current practices need a minimum of 0.06 per cent magnesium present in the iron and must add two to four times this amount to the ladle because the violent reaction makes recovery so inefficient. Allis-Chalmers treats its iron with 0.4 per cent NaCl, 0.8 per cent $MgCl_2$, and 1.8 per cent $CaSi_2$.

The Allis-Chalmers Research Laboratories evidently did not limit themselves to studying the effect of the interaction of $MgCl_2$, NaCl, and $CaSi_2$. They also experimented and produced nodular iron with the chlorides of barium, cerium, lithium, rubidium, and strontium and the silicides of barium and potassium.

In examining the results of this research one is reminded of a report by Prof. de Sy at the International Foundry Congress at Amsterdam in 1949 when he claimed production of nodules in iron by adding calcium, alloys of calcium, such as copper-calcium, and calcium salts, like $CaCl_2$. At that time Prof. de Sy also demonstrated the nodulizing tendencies of lithium, barium, strontium, and sodium. The significance of the strong desulphurizing action of these alkaline metals emphasized the importance of reducing sulphur content of the base iron below 0.02 per cent.

It wasn't long thereafter, at the 1954 AFS Convention, that a paper by Henderson and Crocket described the injection of finely divided calcium carbide into molten iron as a production process for desulphurizing iron prior to the nodulizing treatment. The 1955 AFS TRANSACTIONS carries a paper by Spangler and Schneidewind who upgraded cast irons by injecting them with a mixture of calcium carbide, magnesium oxide and rare earth oxides. Complete nodulizing was obtained by incorporating magnesium powder into this mixture.

And so Ihrig and his research cohorts in 1956 have come up with a logical yet imaginative procedure that has promise of surpassing all other nodulizing techniques.

Charring and burning destroyed these boards during one day's use.

8 RULES to Save Bottom Boards

Studies at Texas Foundries show ways to slash cost of bottom board replacement

MILTON APPLEFIELD / *Technologist*
Forest Products Department
Texas Forest Service
Lufkin, Texas

Build bottom boards without joints, treat them with water glass and the life of boards can be doubled while costs are reduced by one-third. These recommendations are among the results of a study conducted at Texas Foundries, Inc., Lufkin, Texas, where the annual replacement cost of bottom boards exceeds $11,000.

The possibility of reducing this sizable annual expense led Texas Foundries to start its efforts to improve the utility of bottom boards. Various materials were investigated, but wood appeared the most desirable material for use by this large producer of malleable and steel castings. Assistance with the problem was sought from the Forest Products Department of the Texas Forest Service and a cooperative project was started. James Butler of Texas Foundries' pattern division guided the investigators in setting up a study which could be made under operating conditions.

The design of the boards used by Texas Foundries is one that is fairly standard throughout the industry. The boards are made by foundry personnel using two layers of lumber nailed together, at right angles, using 10 to 20 eight penny nails. Both the upper and lower layers are usually composed of two pieces of lumber. The lower layer is shortened and beveled on two sides.

During the six month study, it was found that the open joints on currently used boards pose the most serious threat to bottom board life. The elimination of these open joints will materially reduce board replacement. Checks, splits, and cracks in the boards also hasten board deterioration since such openings gradually enlarge and serve as flues to carry heat and flame.

Joints can be eliminated by using wide lumber, but such boards tend to check and split with changes in moisture content and cannot be recommended. Use of laminated boards, glue-joint boards made from materials such as standard 2-1/2 in. dressed and matched factory flooring, or particle board is indicated.

Particle board is a comparatively new wood material whose value to the castings industry was disclosed when the investigation at Texas Foundries branched into a study of the suitability of local hardwoods for board stock. Particle board is produced from wood particles compressed with synthetic resins. It is hard and it withstands heat deterioration under prolonged and continued foundry use. A series of 19 in. x 19 in. x 1-1/2 in. test boards, commercially made of southern yellow pine particle board, were repeatedly used in pouring a minimum of 25 castings with little or no sign of deterioration. This board currently costs about 31 per cent more than the ponderosa pine boards now used, but tests indicate that Texas Foundries can make an annual saving of about $3700 because these boards have double the current board life.

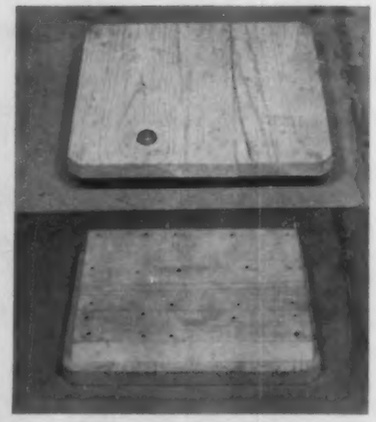
The use of nails was found to contribute heavily to board damage. Nails conduct heat, particularly near the center of the board where they are often concentrated and where the heat is generally most severe. This results in the charring that occurs around nails. Another objection to nailing is that many splits are made in boards in nailing, either by hammering or by the nails themselves.

Ordinary nailed bottom boards cannot readily be salvaged for reuse, however boards made of a single thickness of laminated wood may be trimmed down to make smaller boards after becoming unfit for use at the designed size.

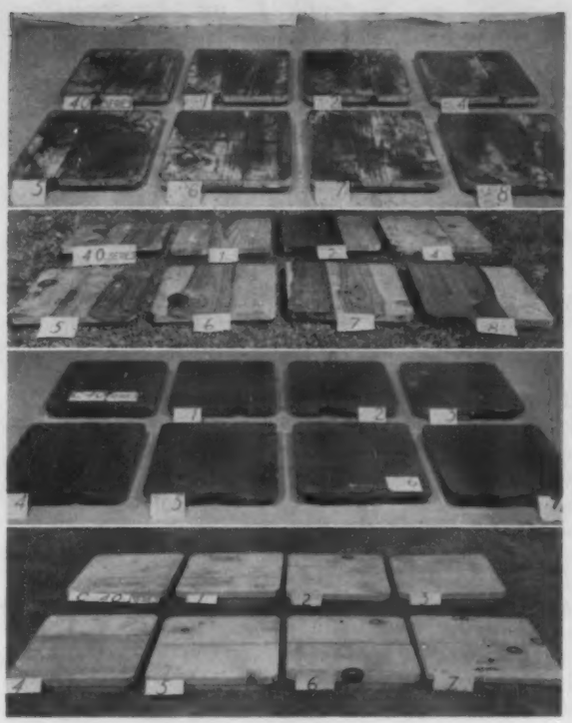
A good bottom board must be able to take rough treatment, especially when used in a high production shop. In such an operation, bottom boards cannot be handled with kid gloves, but some improvements in handling techniques are possible.

The greatest handling damage occurs when bottom boards are thrown onto trucks for return to the molding department. Some of this rough handling may be eliminated by an educational program. Additional reduction of jarring may be realized by flooring trucks and pallets with a layer of cork or similar material.

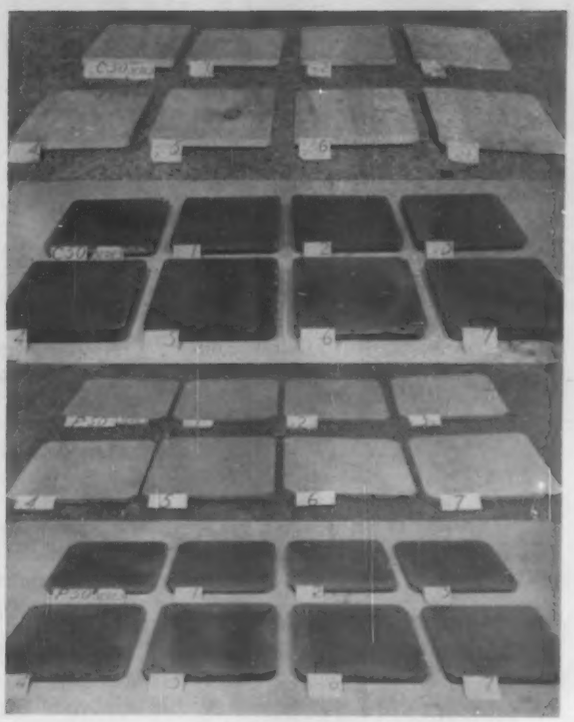
Heat intensity, the most critical factor in board deterioration, can be controlled by keeping sufficient depth of sand between the lowest point of the casting and the surface of the bottom board. With the castings being made on 19 in. x 19 in. boards, a 3 in. depth of sand separating the board and the molten metal resulted in minimizing



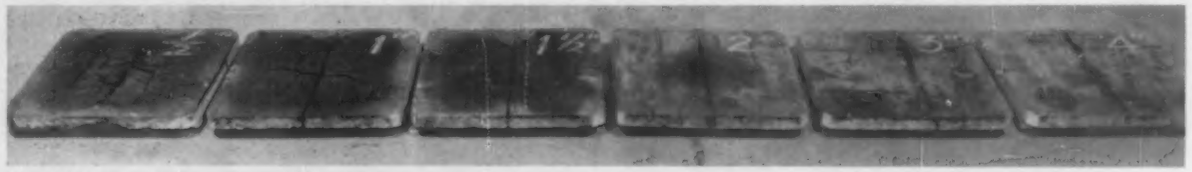
Use of bottom boards made to the time-honored design may result in needless expense.



Effect of water glass treatment. Before-and-after photos "40" show untreated boards. Photos "C40" show superior condition of treated boards.



One-piece construction improves results. Before-and-after photos "C50" show one-piece pine boards. Photos "P50" show results with new particle board.



The more sand between the board and the molten metal, the longer the board lasts. Numbers show distance.

burning and charring of the bottom boards.

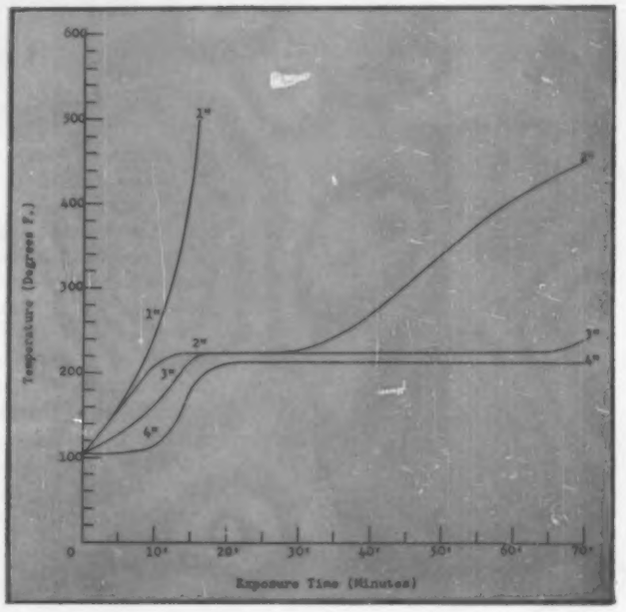
Although several fire retarding compounds were used to treat bottom boards, none appeared to exceed the results obtained with water glass. Three heavy coats of water glass, brushed on all exposed surfaces of the boards, can be recommended as a means of lengthening the service life of bottom boards. Water glass containing the highest percentage of silica in the compound is preferred.

The results of the study, its conclusions and recommendations, should not be construed as representing the final answer to bottom board difficulties. However, the natural advantages of wood for this foundry use can be improved considerably and at substantial savings by careful application of the recommendations.

The combustible character of wood, when subjected to the high temperatures of foundry operations, can be minimized by improved bottom board fabrication methods and by board treatment. It may also be possible to modify certain foundry procedures to further increase board life. The major factor influencing wooden bottom board deterioration may be brought under a measure of control in any foundry by following these specific recommendations for lengthening the service life of bottom boards:

- The use of molding sand as insulation against the heat of molten metal probably offers the simplest and most effective means of protecting the bottom board. A minimum compressed thickness of 3 in. of molding sand between casting and bottom board surface is recommended for all molds of equivalent size to those normally supported by 19 in. x 19 in. boards.
- Nails should not be used for board construction. If boards must be nailed, use only as many as need for proper strength requirements. Distribute nails so there is no concentration in any area, particularly the center of the board.
- Fire resistance can be improved by coating the edges and surface of boards with a high-silica ratio water glass.
- Build boards without open joints. Checks or splits in the wood should be avoided.
- Boards should be dated on their first use so that an accurate service record can be maintained and defects noted for correction.
- Rough handling, particularly throwing boards onto hard surfaces, should be reduced through educational supervision.
- More care in pouring the metal will reduce damage resulting from overflows.
- Castings should be removed from the bottom board as soon after pouring as possible.

Chart shows effect of exposure time and sand thickness on the obverse surface temperatures.



INSTEAD OF FEDERAL AID . . .

Deane W. Malott, Cornell University President Proposes Industry Aid Plan

You are already aware of the "tidal wave of college students" predicted in many a cliché for the 1960's.

The matter of sheer numbers of students as applications mount poses gigantic problems to higher education. We welcome these problems as inherent to education in a democracy. Foundrymen welcome them, I suspect, as possible relief from the mounting competition for the output of trained engineers. The hundreds of thousands of dollars which industrial enterprises are paying today just to recruit engineers may convince the backward that it would have been more efficient to have spent more money in helping the universities as FEF has done, to provide facilities for more engineering training in the first place.

Your very existence, you of the Foundry Educational Foundation, bespeaks your professional interest. I say "professional" in contradistinction to "vocational," for I assume your first consideration is not now, if it ever was, to have the colleges and universities train foundry workers for the great industrial processes of America. That would be sheer vocationalism, far better done in your own shops under your own foremen than in the expensive academic buildings on the campuses of the 1800 colleges and universities of America.

Our task is not to compete with foundrymen in the training of men for particular industrial jobs but rather to prepare men in the theoretical aspects of science and engineering—men with backgrounds in chemistry, physics, and mathematics, in materials, who may grasp the import of industrial objectives and understand the motivations of human beings through whom industrial objectives must be attained. Men, too, who are skilled in the thinking process, imaginative and ingenious in the search for alternatives, curious, and adept in the habits of investigation, critical in appraisal, with mental tools steeled to the task of approaching a problem and solving it.

The colleges are turning out such people.

My plea, therefore, is that you of industry and commerce broaden once again your outlook upon your responsibilities toward education.

It was several decades ago that industry took its first steps toward responsibility in the educational process. At first, research funds were made available, often personal grants to individual professors, to solve knotty problems requiring either abilities or apparatus not otherwise available. Grants later became broader in scope, but still with a *quid pro quo* explicit in relationship; otherwise stockholders' money was being carelessly dispersed. Then there were scholarships and fellowships for the training of students, usually at the graduate level, who might become potential employees. Later, gifts were started by venturesome corporations for the general support of certain college and university departments, in the technical and scientific areas of particular concern to the individual enterprise.

Now, however, a growing number of corporations, alongside the continuation of all these other types of worthwhile support, are saying that their gifts should somehow be for the benefit of all higher education, to be expended at the unrestricted discretion of educational administrators. The courts of the land have upheld such support as being not only valid but laudable.

Unrestricted corporate gifts, therefore, are coming more and more to be recognized as the mainstay of private higher education. Tuition is nearing the place where further increases cannot be made without danger of creating a class society of American youth, an idea repugnant to all who value our American heritage. Yet uncontrollable costs, for materials and wages, and salaries spiral upward in these years of continuing prosperity and inflation.

There are three possible answers to the problems we face—the slow strangulation of privately supported education, leaving only the mass-production educational facilities of the great and growing state universities and other tax supported institutions; the Federalization of all education, or at least Federal aid, whose proponents lobby ceaselessly before Congress; or rapidly increasing and unrestricted support in significant amounts, on the basis of annual contributions, from the industrial and corporate strength of the nation.

Federal aid to private education appeals to me not at all. I believe the tax-supported colleges and universities should be close to their constituencies and directly responsible to them. Yet each year before the Congress the pressures grow for Federal aid, for grants to the States, or direct and indirect appropriations for educational ventures of all sorts.

The recent Congress had before it a bill proposing grants for medical school buildings and facilities, available to both state-supported and private medical schools. It was sandwiched between provisions for health research. Yet the proposal came without adequate information ever having been sought from the presidents or trustees of universities having medical schools, and with no study as to whether medical schools need money more than other schools.

But when we turn to corporate giving, the last of the alternatives for survival of private higher education, the picture takes on saner perspectives.

The response in recent years has been gratifying. An increasing number of corporations has made funds available to colleges and universities, and increasingly on an unrestricted basis. The percentage is still small; far less than one percent of corporate income before taxes, but in a recent year it produced $70 million for higher education. If a full one per cent were given, $340 million a year would give vigor and vitality to the stream of higher education.

Is it too much to ask? The free world will not go down to defeat because of our lack of machines or because we cannot support our population or because of our lack of technical know-how. Our greatest lack today is lack of perception and insight as to how men and nations may live together; we are inexperienced and lackadaisacal in meeting the time-consuming responsibilities of unselfish leadership; we do not read enough, do not discuss enough, the great social, political and economic problems of the day; we have too little of the Faith of Our Fathers who built our way of life.

Is it worth while and can it be done? Remember, as you smoke your after-dinner cigar or cigarette, the entire cost of all higher education in America, every red cent of it, is less than half the nation's bill for tobacco consumption.

So very little, with so very much at stake!

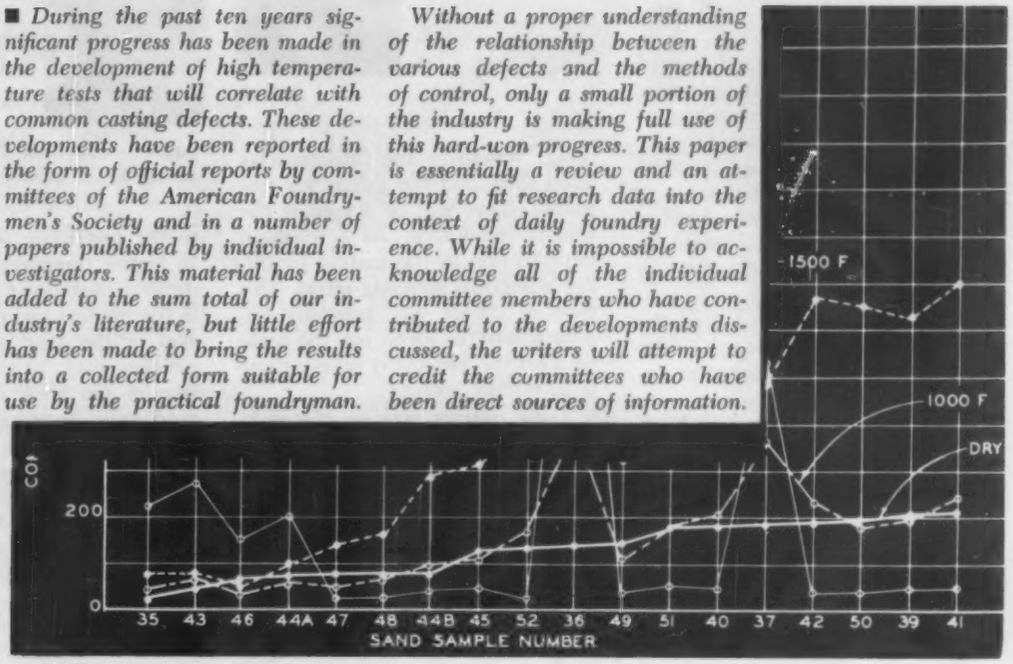
Condensed from the paper presented to the Foundry Educational Foundation Convention, March 7, in Cleveland.

HIGH TEMPERATURE SAND TESTS...

How they promote casting quality

■ *During the past ten years significant progress has been made in the development of high temperature tests that will correlate with common casting defects. These developments have been reported in the form of official reports by committees of the American Foundrymen's Society and in a number of papers published by individual investigators. This material has been added to the sum total of our industry's literature, but little effort has been made to bring the results into a collected form suitable for use by the practical foundryman.*

Without a proper understanding of the relationship between the various defects and the methods of control, only a small portion of the industry is making full use of this hard-won progress. This paper is essentially a review and an attempt to fit research data into the context of daily foundry experience. While it is impossible to acknowledge all of the individual committee members who have contributed to the developments discussed, the writers will attempt to credit the committees who have been direct sources of information.



This Bonus Section is the paper presented to the International Foundry Congress in September as the official AFS exchange paper

A MODERN CASTINGS BONUS

This section is the 17th in a continuing series of special reports. Each of these sections is a handbook of practical and current information valuable to foundry management and to operating and technical departments. A limited number of reprints of these reports are now available for 50 cents each.

MOLD SURFACE FAILURE: Where Defects Begin

HARRY W. DIETERT / *Chairman*
Harry W. Dietert Co.

VICTOR M. ROWELL / *Vice-President*
Harry W. Dietert Co.

ALEX L. GRAHAM / *Research Eng.*
Harry W. Dietert Co.

When the surface of a mold fails, the casting produced from the mold will demonstrate one of the following casting defects: cuts, washes, erosion scabs, rat-tails, buckles, or expansion scabs. These defects are linked to the elevated temperature properties of sands and may be predicted, and thereby controlled, through high temperature testing.

In order to identify and control casting defects, the foundryman must have some understanding of the mechanisms causing the defects. Unfortunately, this is an area filled with unknowns, but there is some general agreement about a number of defects and it might be well to discuss briefly the theories in common acceptance.

When molten metal enters the mold cavity, a number of forces come into play that attempt to destroy the mold. These forces include hot gases produced in heating the mold, expansion of the sand grains, and the work done on the mold by the flowing metal itself.

When metal flows into a mold cavity, its turbulence and its shearing action against the mold walls tend to scour the mold surface and tear the sand grains from one another. Wherever the intergranular bond fails, and the grains are displaced, there will be a void in the smooth mold face and a resultant imperfection in the casting requiring additional cleaning effort. This type of defect will generally appear where the metal has the highest velocity, especially where there is a "nozzle" effect.

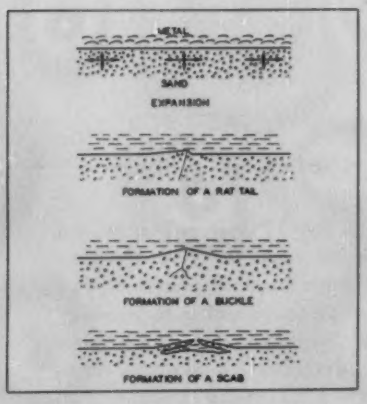


Fig. 1 Mold surface defects.

These defects may be placed in the category of erosion defects and can often be identified by their location and by the presence of sand imbedded in the casting at some other point downstream, or above the original void. Cuts and washes and erosion, or type "B", scabs fall in this group.

By virtue of its kinetic energy and static pressure the molten metal also tends to deform the mold mechanically and to change the dimensions of the cavity. This will, of course, affect the weight and size of the finished casting. This growth or distortion is seldom considered as a surface defect and since much of the mold deformation occurs in the cool subsurface sand, the proper approach to this problem lies in room temperature testing.

The destructive effects caused by the temperature of the molten metal are especially serious in producing casting defects, as many of the common casting faults are due to the instability of the sand mix at higher temperatures. Heat produces a breakdown or an alteration in the binders and promotes expansion of the sand grains. This expansion may produce internal stresses too great for the rammed sand mass to withstand, and the mold surface will fail. Failure can occur in a number of forms such as rat-tails, buckles, or scabs. The relationship between these failures is illustrated in Fig. 1.

In eliminating defects, the foundryman must reduce the magnitude of the disruptive forces, or increase the magnitude of the restraining forces. In any event, the foundryman has to be able to measure the basic properties and high temperature reaction of his sand as a guide to proper control. Ideally, the same tests should also be of value in predicting defects so that the foundryman can take corrective measures before the sand becomes an immediate problem.

A number of tests have been developed that measure the ability of a sand to withstand compressive loading at high temperatures, the magnitude of the expansion at various temperatures and the amount of deformation that a sand will undergo before collapse.

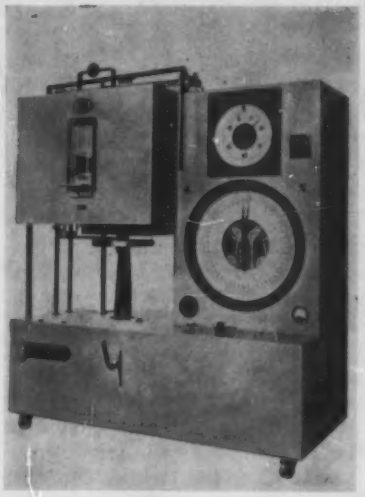


Fig. 2 High temperature unit tests sand under compression.

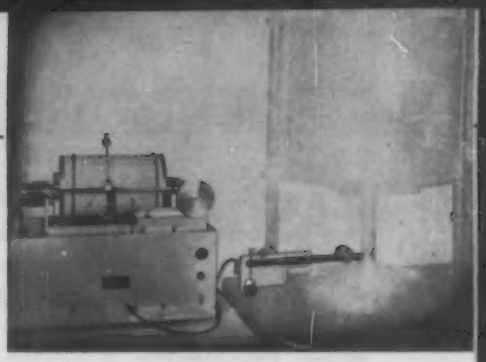


Fig. 3 Hot deformation unit records stress-strain data.

TEST EQUIPMENT: Predicts Failures

To measure the properties of foundry sands at elevated temperatures the foundry laboratory should be equipped with a number of specialized instruments. The basic unit should be a high temperature furnace with a loading system capable of breaking the sand specimens in compression at any temperature up to the pouring temperature. Suitable equipment should also be provided for measuring hot deformation and expansion.

Fig. 2 shows one type of basic test instrument commercially available for high temperature testing. This unit is a Dietert Thermolab with a furnace having a temperature range from room temperature to 3000 F. It is equipped with a sensitive temperature controller and the furnace is constructed so that the hot zone is accessible from the side or from below. This model has a hydraulic loading system capable of applying a compressive load as high as 5000 psi on a 1-1/8 in. diameter specimen. The load is applied hydraulically but measured mechanically for maximum accuracy. Through a simple adjustment of the mechanical linkage, the range can be varied from 0 to 50, 0 to 500 or 0 to 5000 psi.

The hot deformation, or movement under load at elevated temperatures, may be measured with an indicator or a recorder attached to the furnace. Fig. 3 shows a hot deformation recorder as it would be mounted on a test furnace for high temperature testing. Deformation of the sand specimen and the load applied are each measured as a change in the position of the core of a differential transformer.

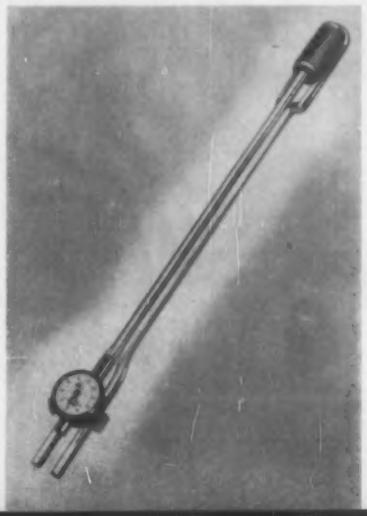
Free and confined expansion tests can be made through the use of a unit like the expansion micrometer shown in Fig. 4. This instrument consists of a quartz frame equipped with a quartz stem dial indicator. The specimen to be tested is inserted in one end of the frame with quartz discs at each end, and a quartz rod is slipped between the specimen and the dial indicator. The end of the micrometer frame is inserted into the test furnace chamber through the horizontal port and the change in length of the specimen is read from the dial indicator.

The elevated temperature tests discussed by the authors were conducted in a furnace heated by a number of silicon carbide elements. The specimens were brought to temperature by radiant heat from the hot furnace walls and from the elements themselves. With this method of high temperature testing, the rammed sand specimen absorbs heat in the same manner as it would on the face of a mold or core. The outer layer in the furnace and in the mold is heated from the surface inward.

The correlation between casting surface defects and high temperature test data indicates that the radiant heating method parallels the conditions found in a mold.

The atmosphere surrounding a mold or core surface will affect the hot properties of a sand, particularly that of a core bonded with an organic binder which will burn readily. A hooded post is recommended for the testing of all cores containing organic binders in order to prevent rapid oxidation of the core binder. The hood, as shown in the section on veining, traps the gases given off by the sand specimen and the specimen is therefore tested in an atmosphere of its own gases. This simulates mold conditions closely with the exception of the gases from the molten metal, but these will be much smaller in volume than gases produced by the mold, or core surface.

Fig. 4 Expansion micrometer is used on free or confined tests.



CASTING DEFECTS:
Products of Surface Failure—No. 1, SCABS

The first objective in dealing with a scab is to place it in its proper category; to decide whether the defect is an expansion scab (type "A"), or an erosion scab (type "B"). This can be done by visual inspection. If the scab forms an integral part of the casting surface, without visible separation between the casting and the defect, it will be an erosion scab formed by the metal filling the void left by sand no longer occupying its proper position in the mold surface. This type of scab may be influenced by the degree of expansion in the mold, but is actually related to cuts and washes in that it is due to the erosion of the mold surface. Since this defect is greatly influenced by the velocity and turbulence of the metal flow in the mold, all scabs found in the vicinity of the gates should be critically examined before assuming that they are expansion scabs, as conditions at this location are especially conducive to erosion.

If visual inspection shows the scab to be separated from the casting mass by a thin layer of sand under most of the defect, this would indicate that it is an expansion scab. The relationship between this type of defect and the rat-tail or buckle is indicated by the fact that many severe expansion scabs will have a rat-tail or buckle underneath them, when the scab is chipped away.

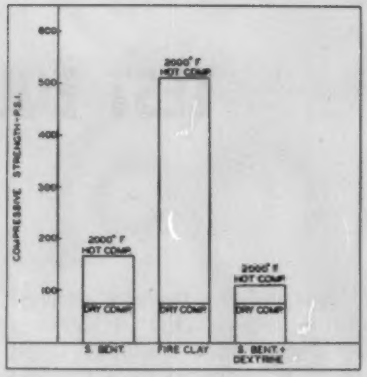


Fig. 5 Hot compressive strength may vary greatly.

Considerations for scab control. Scabbing may have a number of indirect causes that should be considered in setting up a control. Localized hard ramming will often produce expansion scabs in an otherwise sound sand, and localized soft ramming can produce erosion scabs, cuts, or washes. Wet spots in the mold can produce "swabbing scabs" which may be either expansion or erosion type defects. If a flask bar or gagger is too close to the pattern this will result in a thin sand section which can also promote scabbing. The causes for these defects lie not only in the sand, but in poor molding practices. Any sand mix containing silica sand has inherent scabbing tendencies and the problem is one of degree. Because of other considerations, a foundry may have to use a borderline sand, but this may not be serious with adequate control and intelligent judgement on the part of the sand engineer. Swabbing scabs and ramming scabs do not require the immediate alteration of the base mix. When recognized, they should be dealt with on the molding floor, not at the mixer.

If a sand produces a number of easily recognized expansion scabs, and occasionally, an apparent erosion scab near the gate, the foundryman should not accept the situation at face value. If an expansion scab is severe enough and is in the path of rapidly moving metal, the sand that normally would be found under the scab may be washed away leaving a depression which will produce an apparent erosion scab. This condition may be identified by the location, the history of the sand and the absence of a drop in the hot compressive strength test results.

These distinctions must be considered when we seek control tests and methods for predicting the occurrence of these defects.

■ **Erosion Scabs.** Erosion scabs are generally produced when the bond between the sand grains is too low

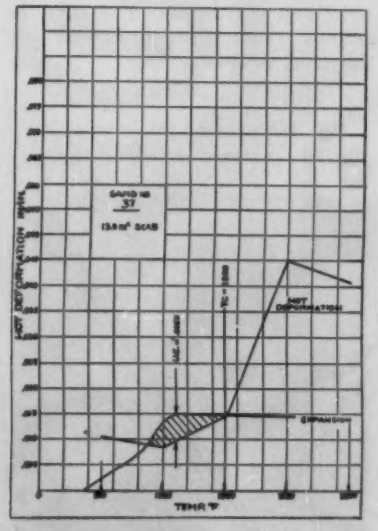


Fig. 6 Included area scab factor is shown by hatches.

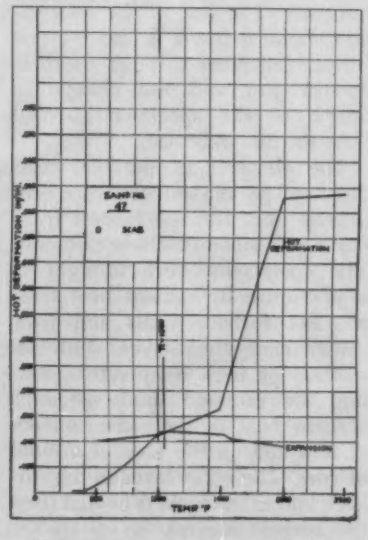


Fig. 7 Expansion exceeds hot deformation in narrow range.

to withstand the pressures applied to the mold surface. For control, the green compressive, dry compressive and air set strength should be tested, but in addition, the hot compressive strength and hot deformation should also be checked over a wide range of temperatures. Failure anywhere from room temperature to pouring temperature will produce dirt inclusions and a rough surface defect that could be termed a cut, wash or erosion scab.

Once identified, this defect may be eliminated through control of the bond additions as called for by the compressive strength values. Sands low in refractoriness may give low hot compressive strength results below the pouring temperature without producing erosion defects if the hot deformation is high enough. These sands are plastic at high temperatures, and while they have little resistance to compressive loads, they will resist the erosive action of flowing metal because of this plasticity. This condition should be avoided as it may lead to fusion defects, changes in dimension and indirectly to centerline shrinks. If the condition is brought on by a build-up in additives it should be arrested by dilution with new sand.

Occasionally, an erosion defect will be caused, or at least influenced, by gases produced during the filling of the mold cavity. In this type of problem the scab will be formed above a green sand or baked core while the core is being surrounded by metal. While the top of the core is being covered with metal, the gases being liberated will cause some agitation of the metal, thereby increasing its erosive action. If this action is accompanied by a reduction in the strength of the binder it can lead to an erosion scab. This type of scab may be identified by its location and once identified can be eliminated by proper venting of the core, or by a reduction in organic material without increasing bond additions and overall cost.

Venting can also eliminate expansion scabs in some cases, as the vent holes provide artificial voids for the expanding sand to fill,

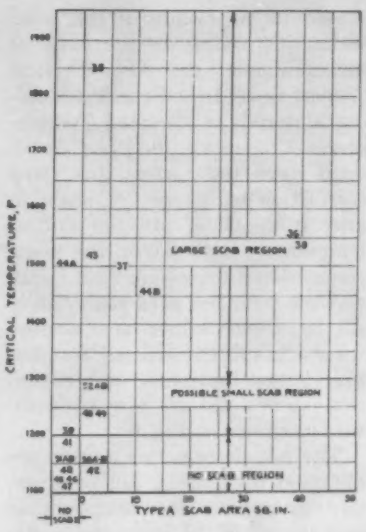


Fig. 8 Critical temperature is plotted against scab areas.

thereby relieving the internal stresses without failure of the mold surface.

Through daily or weekly control of the hot compressive strength and hot deformation along with regular room temperature testing, any tendency toward erosion scabbing can be observed as a drop in strength and/or deformation and steps can be taken to correct the difficulty before the change becomes apparent as a drop in casting quality.

For control testing, the hot compressive strength test should be run on a 1-1/8 in. diameter, 2 in. long specimen. The specimen may be double-end rammed with three blows of a seven lb weight or rammed to the same mold hardness as the molds in the shop. Either method may be used, but the practice must be standardized and maintained at all times.

The hot compressive strength may be raised by an increase in clay, the substitution of sodium bentonites for calcium bentonites, an increase in fines, or through the addition of a number of commercial organic binders.

The control of erosion scabs solely by dry compressive strength testing is dangerous as this does not give an accurate indication of the bond at high temperatures. Figure 5 illustrates the variation in hot compressive strength that may occur between sands having the same dry strength. Each binder is affected differently by temperature, and while a number of mixes may have the same green or dry properties, the strength of each will vary at high temperatures with the changes in the condition of the binder.

■ **Expansion Scabs.** During the pouring operation, the walls of the mold cavity are brought to a high temperature very quickly, but due to the insulating properties of the sand, there will be a severe thermal gradient across the first layers of sand. The surface layer will increase in temperature at a greater rate than the sand immediately behind it. The silica grains will expand rapidly and build up severe compressive stresses in this thin layer, if the grains cannot rearrange themselves to relieve the stresses. If there is no relief, the surface layer will rupture. One form of rupture produces the expansion, or type "A", scab. This scab is a defect with thin protruding edges, raised above the casting surface and separated from it by a layer of displaced sand. This type of scab may be pried or chipped off, leaving a depression in the casting surface.

With the present test methods, neither the total expansion nor ultimate hot compressive strength will show correlation with type "A" scabbing. This would indicate

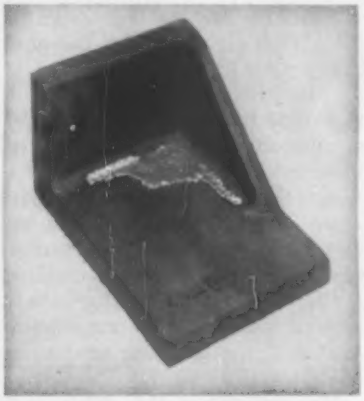


Fig. 9 Scab defect measured by weighing aluminum foil.

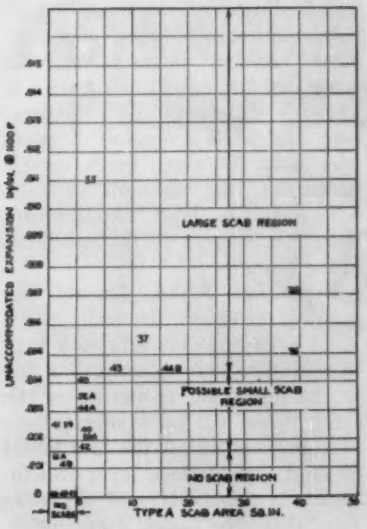


Fig. 10 Scab area is compared with excess sand expansion.

that there is some factor involved other than the amount of expansion, or the mechanical bond between the sand grains.

When a specimen is loaded in compression at elevated temperature, it deforms before breaking, indicating that a rearrangement in grain orientation has taken place. This ability of the sand to change in packing would explain how the sand grains in a mold can expand without producing compressive stresses strong enough to rupture the mold surface. This capacity for rearrangement, or hot deformation, is measured with a hot deformation recorder as shown in Fig. 3.

The AFS Physical Properties of Steel Foundry Sands at Elevated Temperatures Committee (8-L), in their 1953 progress report on the study of the hot properties of steel molding sands at elevated temperatures, show laboratory evidence that the maximum temperature at which the expansion exceeds the allowable deformation varies with different steel molding sands. A brief casting study showed that as this temperature increased, the scabbing tendencies of the sand increased.

Theoretically, if the ability of a sand to rearrange itself is greater than its tendency to expand, there should be no failure of the mold surface. Working on the basis of this principle, the AFS Physical Properties of Iron Foundry Molding Materials at Elevated Temperatures Committee (8-J) has developed three test factors that show correlation with type "A" scabs in gray iron. These are the critical temperature scab factor, the unaccommodated expansion scab factor and the included area scab factor. All of these values are derived from a graph constructed by plotting hot deformation and expansion values against test temperature as shown in Fig. 6.

The hot deformation results are obtained by running hot compressive strength at five temperatures and recording the stress-strain diagrams using a hot deformation recorder. The hot deformation data used for the graphs is measured as the total deformation of the specimen up to the point where the rate of collapse exceeds the rate of load. The hot deformation values are then plotted against temperature and the individual points are connected by straight lines. Figs 6 and 7 were constructed with hot deformation values for only five temperatures.

The expansion test is made on a 1-1/8 in. diam, 2 in. long specimen. The specimen should not be confined during the test. It should be free to expand radially, as the specimen tested for hot deformation is also free to expand radially. The rammed specimen is placed on an expansion micrometer frame, Fig. 4, and inserted in the testing furnace at room temperature. The furnace is then heated at the rate of 10F/min and the expansion is read from the dial indicator. The expansion with temperature is then plotted on the same graph with the hot deformation data using strain as the common ordinate.

When this type of graph has been constructed, three characteristics of the sand can be determined, or at least indicated. These characteristics are: the temperature range where unrelieved stresses exist, the magnitude of the stress at each temperature and the total stress over the entire temperature range to which the sand is exposed.

Critical temperature scab factor. A comparison between the graph for a scabbing sand, Fig. 6, and the graph for a non-scabbing sand, Fig. 7, indicates that the expansion will exceed the hot deformation over a wide range of temperatures for a scabbing sand, whereas this condition will be true for a relatively narrow range of temperature in the case of a non-scabbing sand.

The temperature at which the hot deformation finally exceeds the expansion is important as it defines the upper limit of the range where the expansion of the sand is greater than its ability to readjust in packing. This temperature, which is usually the second intersection of the curves, has been termed the critical temperature. Figure 8 shows the critical temperature plotted against the scab area for a series of sands. The castings were made using the AFS Committee 8-J scab pattern, and Fig. 9 shows one of these castings with aluminum foil covering the scab defect. The scabs were covered in this fashion and the foil was weighed to determine the area.

The graph shows that sands having a high critical temperature will have a greater tendency to scab than those sands having a lower critical temperature. The grading of sands on the basis of the critical temperature is not perfect, but it is certainly good enough to justify its use for sand control.

Unaccommodated expansion scab factor. If the hot deformation is an index of the ability of a sand to change in packing, the amount by which the expansion exceeds the hot deformation should be a measure of the magnitude of the unrelieved expansion stresses. When the hot deformation is subtracted from the expansion, the excess expansion is termed the unaccommodated expansion.

Figure 10 shows the relationship between the unaccommodated expansion at 1100 F and the scab area, for a number of gray iron sands. This temperature, 1100 F, is used as it is only slightly above the Alpha-Beta conversion temperature. The graph shows correlation

between the unaccommodated expansion and the degree of scabbing.

Included area scab factor. On a scab control graph such as Fig. 6, the unaccommodated expansion for a given temperature is the distance from the hot deformation line up to the expansion line. This distance is shown as U.E. on the graph. Using this distance as an index to the magnitude of the expansion stresses at a given temperature, the whole area within the curves, from the first cross-over point to the critical temperature, shown as "Tc", can be used as an index to the magnitude of the expansion stresses over the entire temperature range. This area is termed the included area scab factor and can be measured with a planimeter or by counting sub-division squares, if the curves are plotted on fine graph paper.

Figure 11 shows the relationship between the included area scab factor and the scab area for a series of gray iron sands. The original graphs were plotted on graph paper so that 400 units were equivalent to one sq in. The included area was measured as the number of units enclosed by the curves.

The graph shows good correlation between the included area factor and the degree of scabbing.

Expansion-load test. The included area, critical temperature and unaccommodated expansion tests show good correlation with scabbing, but these tests are rather time-consuming and as a result, are costly to use for daily control testing. A new test method has been developed that answers this objection as it is a relatively simple, short-cut test method for detecting scabbing tendencies. This is the expansion-load test, which may be run on a sample in ten minutes.

The principle behind this test is simple, to determine the magnitude of the compressive stress to which a sand is subjected by its own expansion. The compressive stress is determined by applying a measured load to the sand specimen in a furnace to prevent it from expanding.

Figure 12 shows the correlation between the test data and length

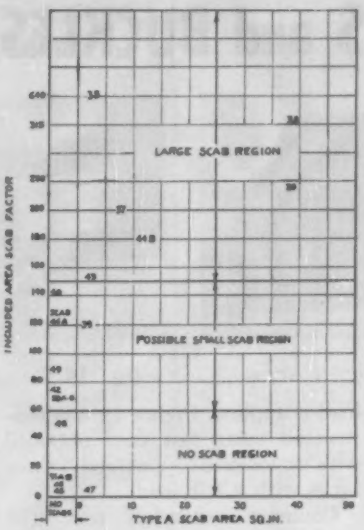


Fig. 11 Included area scab factor shown with "A" type.

of defect for a number of sands used in the January, 1956, work of the AFS 8-J Committee. The length of defect was used in this graph as scab area measurements are time-consuming and cannot be plotted on the same graph with the rat-tails measurements as they are expressed in other dimensions.

The two sands that do not fall close to the line in Fig. 12 are both veining sands. This should be expected, as veining in molding sand is undoubtedly influenced more by shrinkage of the sand, on drying at relatively low temperatures, than by high temperature expansion.

The correlation in Fig. 12 is good but the test is new and more work will be required to determine how this test will perform with sands that are not used in gray iron work.

One of the principle advantages of this test is the fact that it appears to differentiate between good sands and those sands that produce rat-tails and type "A" scabs. Since these defects are all expansion defects, a well designed expansion test should separate the good sands from the sands that produce any of these defects.

Steps for control. Using the hot deformation and expansion results as described, the foundryman can use the three derived scab factors for the control of type "A" scab defects. All three scab factors should be kept as low as possible. If only one scab factor is to be considered it would be best to use unaccommodated expansion as it is less time-consuming than the included area method and on the basis of Figs. 8 and 11, it produces better correlation than either the critical temperature, or the included area scab factors.

Before changing the composition of a type "A" scabbing sand the foundryman should examine the defect carefully to be sure that the scab is a type "A" defect. The moisture control and degree of ramming should also be investigated, as high moisture and hard ramming can promote the formation of this defect. If the defect is sporadic, the frequency of occurrence of the defect may follow variations in moisture and ramming. This can be detected by comparing sand control and casting defect control charts.

If the defect is not due to variations in control, it can be eliminated, or greatly reduced, through the additions of cellulose materials, such as grain hulls, wood flour, or cereals. Carbonaceous materials such as seacoal or pitch may also be of value. The elevated temperature properties should be checked when the mix is changed to insure that the expansion is being lowered and that the hot deformation is being increased.

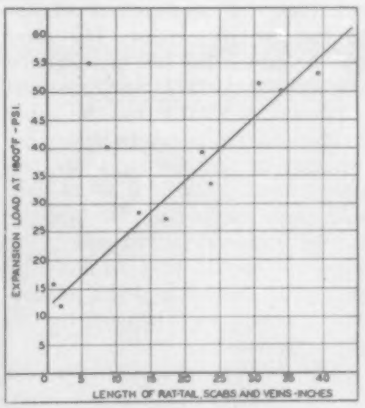


Fig. 12 Correlation between test data and defect length.

No. 2, RAT-TAILS and BUCKLES

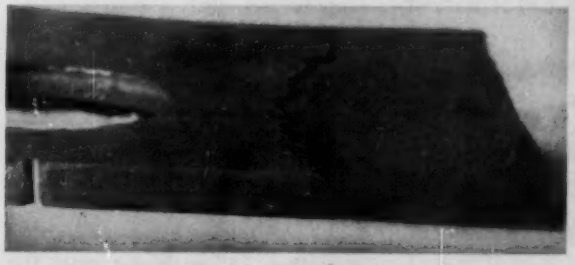


Fig. 13 Severe rat-tailing condition is shown.

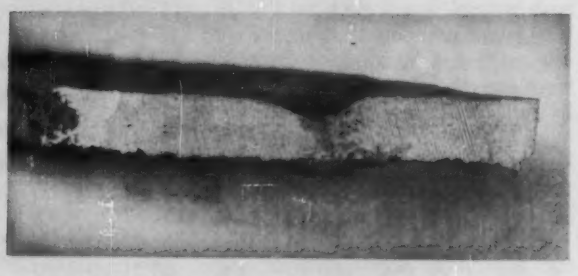


Fig. 14 Buckling is another expansion defect.

Rat-tail defects, shown in Fig. 13, and buckles, shown in Fig. 14, are expansion defects that are subject to close control through high temperature testing.

The AFS Physical Properties of Iron Foundry Molding Materials at Elevated Temperatures Committee (8-J) found good correlation between rat-tail defects and a hot compressive strength-confined expansion relationship. A sand showing a high confined expansion at 2500 F and a high hot compressive strength at 1000 F will tend to produce rat-tails or buckles. Fig. 15 shows the relationship between the above properties and rat-tail defects in gray iron castings made with the rat-tail pattern developed by AFS Committee 8-J. This pattern produces castings in the form of a plate 11 in. long, 9 in. wide and 1/2 in. thick.

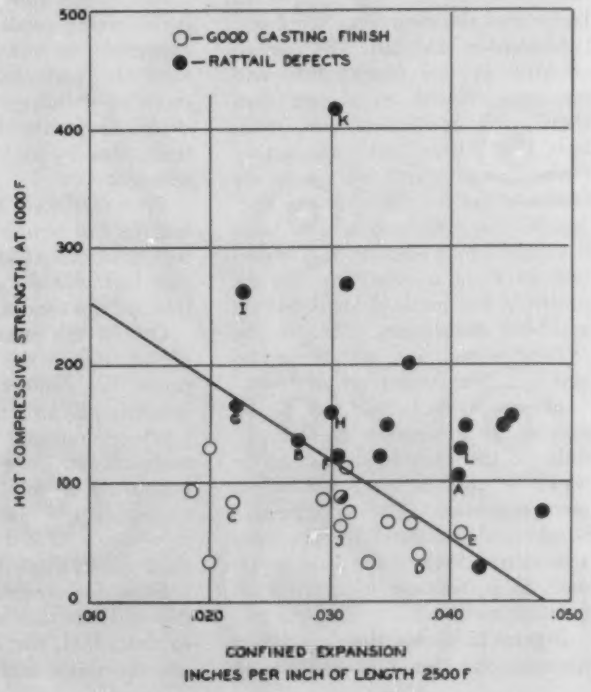
Hot compressive strength test. Figure 15 may be used as a rough reference for applications similar to the rat-tail casting. The sand can be tested for hot compressive strength at 1000 F and confined expansion at 2500 F and the value plotted on this graph to determine whether or not the sand has rat-tailing tendencies. If the test data falls close to the line dividing the rat-tail and non-rat-tail zones, the sand mix should be considered as subject to defects and the composition should be changed to improve the mix.

The hot compressive strength test is run in a test furnace using a 1-1/8 in. diameter, 2 in. long specimen. The specimen is soaked at 1000 F for 12 minutes before load is applied. Figure 15 was constructed using test data obtained with specimens rammed three times with a 7 lb load.

Confined expansion test. The confined expansion test is made on a 1-1/8 in. diameter, 2 in. long specimen with a 1/2 in. diameter hole through the center. The specimen is rammed in a fused quartz tube so that the radial expansion is restrained. The sand, therefore, is only free to expand along the long axis of the tube. The specimen is designed with a 1/2 in. hole so that it will reach uniform temperature quickly. As quartz softens at 2500 F the micrometer frame in the hot zone of the furnace must be supported from below to prevent warpage.

It should be remembered that the graph was constructed on the basis of a fixed size and shape of gray iron casting. For other metals, other patterns, or any other conditions, the relationship between the physical properties and the defect may be somewhat altered.

Fig. 15 Test data when falling close to line indicates that sand mix is subject to defects.



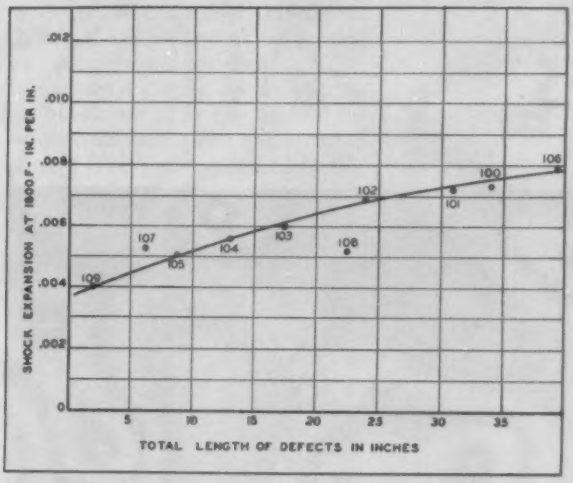


Fig. 16 Shock experience test data may be used to predict whether sand will cause a mold fracture.

Shock expansion test. This test is based on a study of test data, conducted by AFS Committee 8-J, covering ten different sands which were used to cast gray iron test castings under closely controlled conditions. Their results indicated that shock expansion test data may be used to predict whether a sand will cause a mold fracture defect such as rat-tail or scab on a gray iron casting. The magnitude of the defect may also be predicted for a given casting.

The greater the shock expansion, expressed in inches of expansion per linear inch of specimen, the greater the total length of defect.

A graphical presentation of this correlation is shown in Fig. 16. It may be noted that an exceptionally good correlation is secured.

The shock expansion test was made by ramming the 1-1/8 in. x 2 in. sand specimen to a green hardness identical to the hardness to which the mold was rammed for each particular sand. A variable height drop of the 1-1/8 in. rammer weight was employed to secure the required hardness. Specimens for all elevated temperature tests should be rammed to the same hardness as that used in the foundry when correlating casting quality with laboratory elevated temperature test data.

The green rammed specimens were placed in a dilatometer furnace at 1800 F and loaded with a 1 psi preload. The load was maintained through the use of a hand pump and the expansion was recorded as a function of time on a deformation recorder as shown in Fig. 3. The expansion was measured at the 22.5 sec mark on the paper wound on the recorder drum.

The magnitude of mold surface fracture was again expressed in terms of total length of defects by measuring the total length of rat-tails, veins, type "A" scabs and buckles. The length of scab was measured as the longest dimension.

Remedies for rat-tailing. There are a number of methods for controlling rat-tails. Moisture control is important as moisture is an indirect cause since it may increase the density of the sand, thereby increasing the expansion and hot compression. Controlling the mold hardness is also important, as the degree of rat-tailing increases with increasing mold hardness. Soft ramming is not the best solution for rat-tailing as it leads to cuts and washes, but the mold hardness must be kept to a specific range as part of good molding practice.

When the moisture and mold hardness are controlled, rat-tails and buckles can be reduced, or eliminated, through the use of cushioning agents such as wood flour, cereal, or similar cellulose materials. Figures 17 and 18 illustrate the effect of these organic materials on sands with particularly severe rat-tail tendencies.

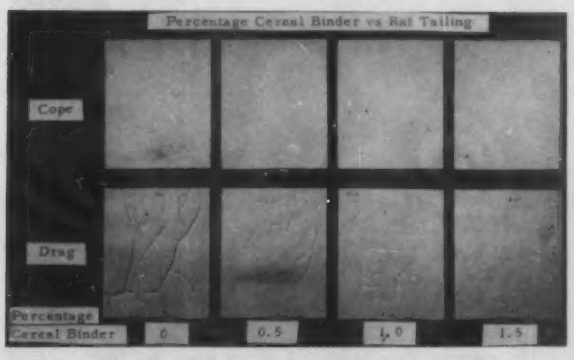


Fig. 17 Cereal additions may control rat-tailing.

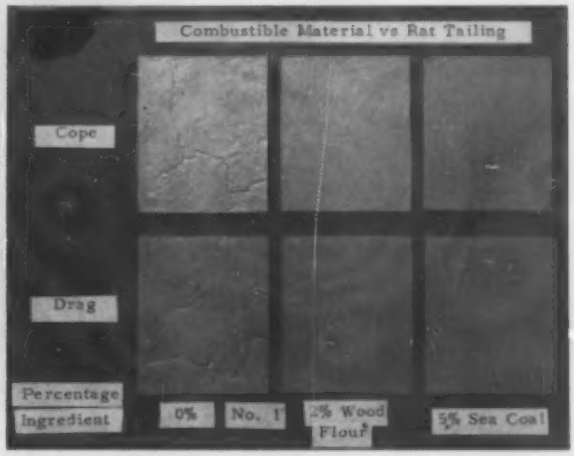


Fig. 18 Combustibles influence defects by their actions on mold hardness and moisture.

No. 3, CUTS and WASHES

In molding sands cuts and washes can be produced by the use of excess moisture, as the escaping steam will agitate the metal and promote erosion. However, if we assume intelligent moisture control, the principle cause of cuts and washes will be a deficiency in bond. The bond must be high enough to withstand the impingement of the metal and the flow of metal across the sand surface. If the bond between the sand grains fails, the sand will be swept away leaving a defect similar to that shown in Fig. 19.

The control of cuts and washes is, therefore, simply a control of the level of binder so that the sand is strong enough to bear the erosion of the metal throughout the temperature range to which it is subjected. A series of hot compressive strength tests from 500 to 2500 F should be run as a control and the binder level adjusted to maintain the strength at the desired values. The green compressive, air set and dry compressive strength should also be measured, as failure of the sand at temperatures below 500 F will also produce these defects.

If a sand is low in refractoriness, it may have a low hot strength at 2000 or 2500 F without failure of the sand surface. This would occur if the surface becomes plastic. In this case, the sand would "give", but the sand grains would not be washed away. This could lead to a change in casting dimension, but would not produce cuts and washes, as such.

In working with a low refractory sand, it would, therefore, be important to test for hot deformation, as well as hot strength, throughout the temperature range. This is easily accomplished through the use of a proper deformation recorder, as the deformation can be run simultaneously with the hot compressive strength test.

Fig. 19 Cuts and washes in molding sands come from binder failure.

No. 4, VEINING

In this discussion of veining we would like to confine the subject to those "veins" or fins that are formed on a casting by the solidification of metal in the cracks developed in cores after the metal is poured. The veining caused in dry sand molds, as a result of cracking during the drying operation, is not a high temperature phenomena, and as a result, should not be approached through high temperature testing.

Veining in a core, as shown in Fig. 20 will usually appear at an angle or other hot spot in the core, where the metal heats the sand from more than one direction. It would appear that veining is caused by expansion, or contraction, in the surface layers of the core, where the sand does not have sufficient hot plasticity to take care of the stresses generated. As the defects usually appear at the point of greatest thermal shock, the rate of expansion with increasing temperature may be directly involved.

A number of tests have been developed that show correlation with veining but, at the present time, these do not include expansion. The most promising tests, at the present time, are hot strength, hot deformation rate and green hardness. Figure 21 illustrates the correlation between hot compressive strength at 2500 F with a five minute soaking period and the degree of veining in an 8-J veining casting for a limited number of core mixes. For this particular gray iron casting and core, mixes having a hot compressive strength over 40 psi at 2500 F, with a five minute soaking period, produce veining, whereas those mixes with less than 40 psi hot compressive strength produce no veining. At 2500 F the hot compressive strength test seems to indicate the refractoriness of the sand. Sands with low hot strength tend to become plastic, but there may be exceptions to this.

The hot strength and hot deformation tests are run in a test furnace equipped with an own atmosphere hood post. The specimen is soaked at temperature within the hood before loading to the breaking point. The position of the specimen in the hood is illustrated in Fig. 22. As there is always some chimney effect in a test furnace, it is necessary to use a hood to achieve a reducing atmosphere similar to that encountered in a mold.

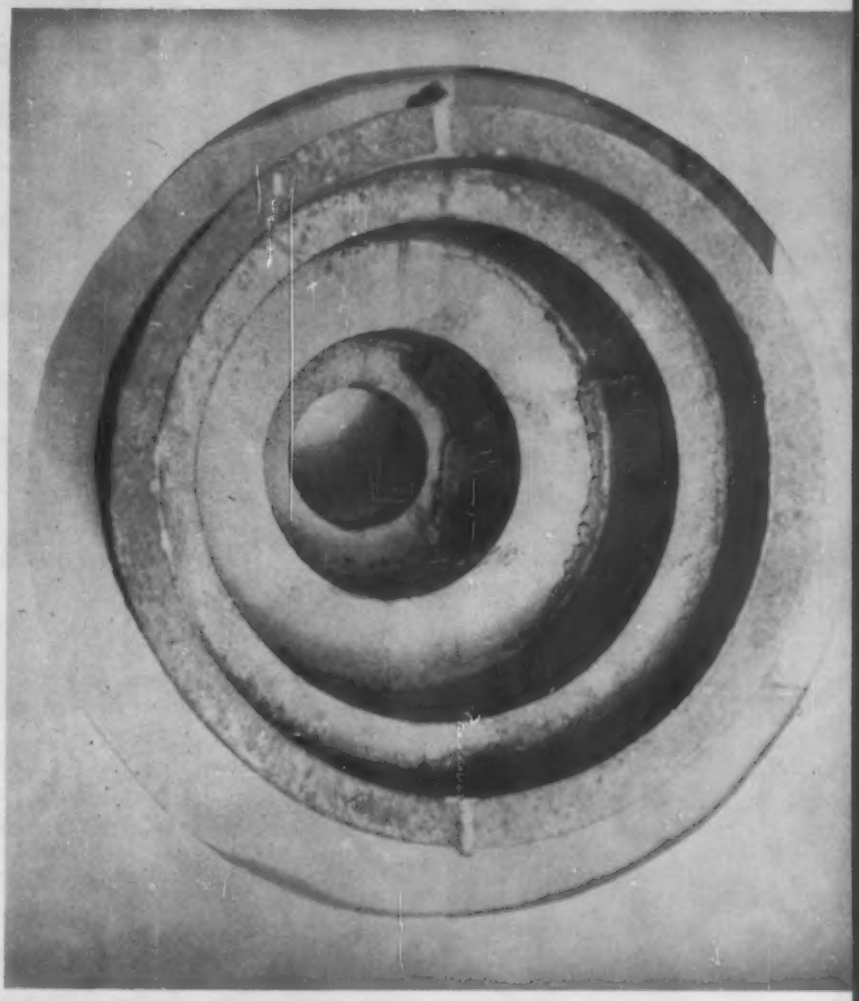


Fig. 20 Veining usually occurs at point of greatest thermal shock.

Veining is a defect that seems to be especially pronounced in hard, brittle sand. High moistures and hard ramming promote veining. A high pouring temperature will also promote veining. The condition can often be ameliorated through the addition of fluxing agents that will reduce the hot strength at 2500 F and increase the hot deformation. Iron oxide is an excellent additive for eliminating this defect. Impure sands have less tendency to vein, but the base sand selected should not contain too much silt or clay, as this will require additional binder which may raise the cost of the casting more than the additional cost resulting from an occasional vein.

The hot compressive strength test at 2500 F should be used as

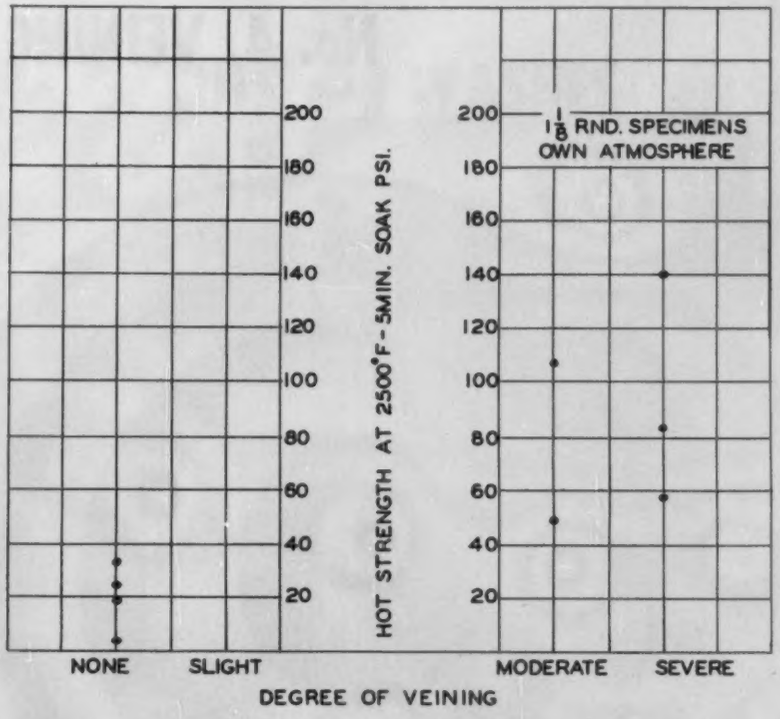


Fig. 21 Hot compressive strength is compared with degree of veining.

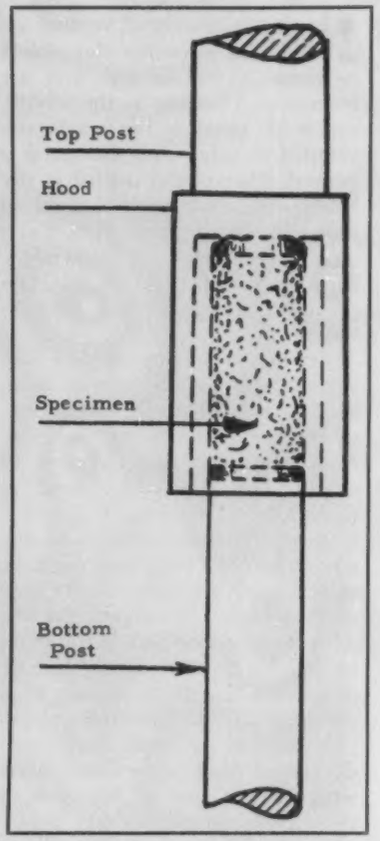


Fig. 22 Hot strength and deformation tests start with high temperature soakings before loading.

a test of veining tendencies when selecting core materials and the specimen should be tested using a five minute soak in an own atmosphere hood post. The rate of hot deformation can also be used as a guide.

Veining in green molding sand is still difficult to predict, but this defect may correlate with expansion load, or some other relatively new test. However, at the present time, there is no recommended test for the control of this defect.

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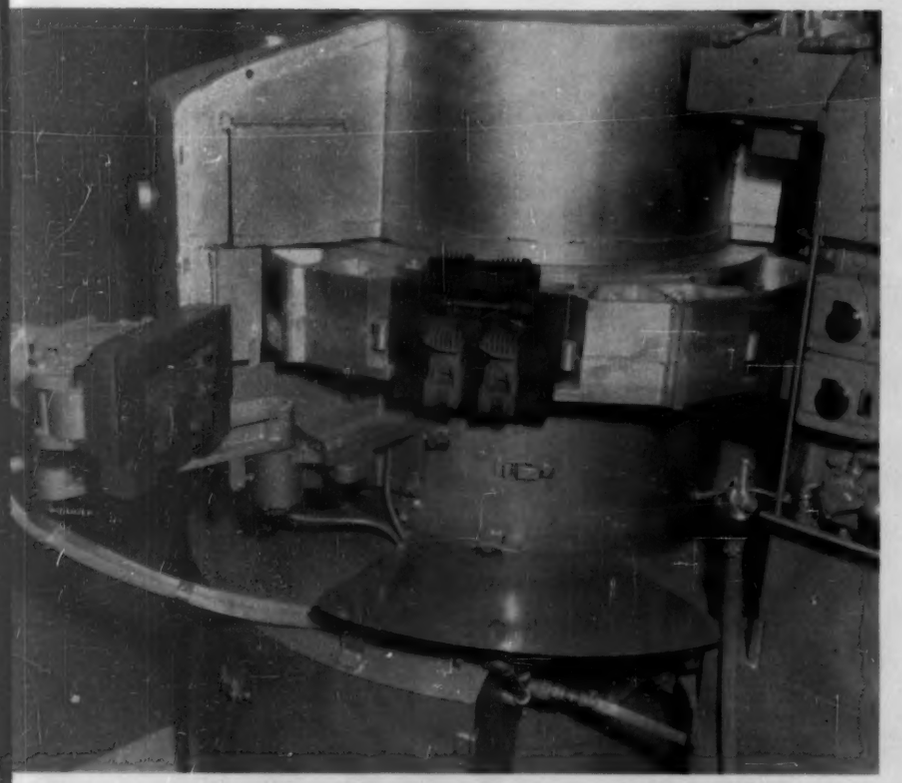
DESIGN TIPS for SHELL PATTERN EQUIPMENT

H. Weaver / *Director of Mfg.*
Brillion Iron Works, Inc.

Know-how in designing pattern plates will help to solve your mold problems



Loose pieces can be designed into core box equipment where needed.

Production difficulties in producing castings in shell molds often stem from the design of the pattern and core box equipment. To avoid these difficulties, a standardized pattern and core box design procedure can be followed.

This is a procedure that includes rules based upon our experience with shell molding; experience that goes back to 1951 and our first homemade, experimental shell equipment. The rules that we have formulated at Brillion Iron Works are not rigid and inflexible, we learn something new each day.

At Brillion, the personnel of the industrial engineering department are employed to design the pattern and core box equipment because of their familiarity with the shop and its problems. Detailed drawings are made of the pattern plates and the pattern inserts as well as the mounting and layout of these insert plates.

Draft is always indicated on the drawings so that the patternmaker or tool and die maker work to exact dimensions. Draft is usually 0.5 degree and shrinkage calculated at 0.012 in. per inch, although numerous castings have been made with a 0.010 in. draft on a 3 in. length.

Pattern Material

The most satisfactory pattern material we have used to date has been a gray iron with the following composition: Carbon, 3.30; Silicon, 2.10; Manganese, 0.75; Nickel, 1.00; and Chromium, 0.50 per cent. The microstructure shows type "A" graphite in a matrix of fine pearlite. This alloy has given us the dense and close grained pattern castings required for shell work.

Aluminum may also be used for shell patterns, but it is not dimensionally stable at higher temperatures. Because it is softer and more open grained, aluminum patterns are more susceptible to damage from mishandling. Brass or bronze patterns, when mounted on a heavy plate, may in some cases be better than iron because of their rapid heat transfer. However, they should be of a hardness equalling iron to withstand normal abuse.

Chrome plating of the pattern surface has been tried and has produced reasonably good results. Our experience with chrome plating is not sufficient to establish the procedure, but it looks very encouraging, especially where pattern build-up is required.

The actual construction of a shell pattern is a subject that should be well understood by everyone working with shell molding. Pattern costs are relatively high and mistakes are very difficult and expensive to correct.

Pattern Plates

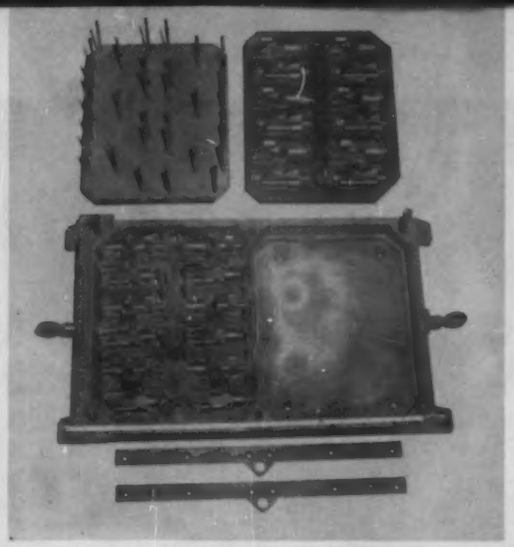
The basic part of the pattern is the pattern plate. A basic pattern plate of 1-1/2 or 2 in. thickness will maintain uniform temperatures throughout the entire plate area. Thinner plates result in troublesome hot and cold spots. Pattern inserts are mounted on this heavy plate. No attempt should be made to hollow out these inserts; keep them solid so that they will conduct heat from the pattern plate and because of their own mass, will act as a heat reservoir.

Our most recent design involves cope and drag insert plates which are set into a pattern frame in the molding machine. These insert plates are used to simplify handling and to reduce the initial cost of the pattern equipment to the customer. The pattern plate, whether it is the insert type or the solid type is rough machined, stress relieved, finish machined, and ground on the pattern side. Patterns to be mounted on this plate can be made in several ways. If the pattern is easily machined, a block of iron is furnished the pattern maker and he will rough machine the part, stress relieve it, and finish machine it for mounting on the plate. Pattern designs of a more complicated nature may require the use of a duplicator or a precision casting.

Where multiple patterns are to be mounted, it is economical to make a master pattern out of brass or aluminum, mount this pattern on an experimental dump box plate and produce shell molded castings for patterns. They can be used for the production pattern after a minor cleanup operation has been performed. Irregular sections of the pattern can be cleaned up if approximately 0.005 in. finish is left. Sections of the pattern that can be machined may have a 1/32 or 1/16 in. finish left for final machining.

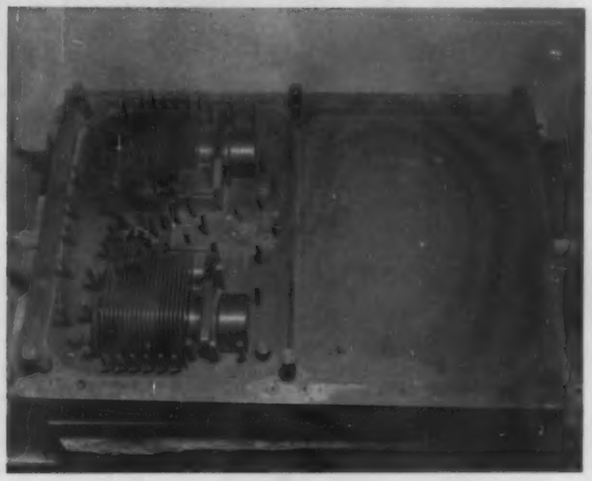
Stripping Pin Design

Stripping pin design is also critical. We have standardized on a commercially available pin which is used primarily in the plastic molding industry. Most of our stripping pins are mounted flush with the plate and every effort is made to keep them outside the pattern surface. We do use in most cases, six headed pins which are built into the pattern frame and are used to position the stripper plate so that



Standard stripping pins are placed flush with the plate and are located outside the pattern surface wherever possible.

Intricate work demands combination of careful mounting with detailed drawings of the pattern plate, pattern inserts.



all of the other pins stay flush with the surface of the pattern.

The flush mounted stripping pins have a head at their lower extremity which is mounted against the stripping plate and is held in place by half inch thick steel hold down plates. Considerable clearance is given these pins in the hold down plate as well as in the pattern plate to allow for expansion of the pattern and stripping plate due to the operating temperatures.

Consideration must be given to the location of the patterns on the plate to allow for gating, stripper pins, locators, and for sufficient area to paste the two halves of the mold together. Core prints must be kept far enough away from the gating, especially when hollow cores are used, to prevent metal from running inside the cores. Mold-half locators must be designed into the equipment unless the core prints can serve the same purpose. We have several jobs where locators are built into the surface and have found that it was necessary to provide closing guides to act as flask pins. These closing guides prevent the operator from scuffing the two halves of the mold together and also prevent him from accidentally brushing the pasting resin into the casting cavity.

Core Box Design

Core box design is dependent on the machine used to produce the cores as well as the individual design of the core. Core box design follows basically the same principals as pattern design. The use of heavy alloyed iron boxes to maintain uniformity of heat is continued and, of course, surfaces must be smooth and well polished.

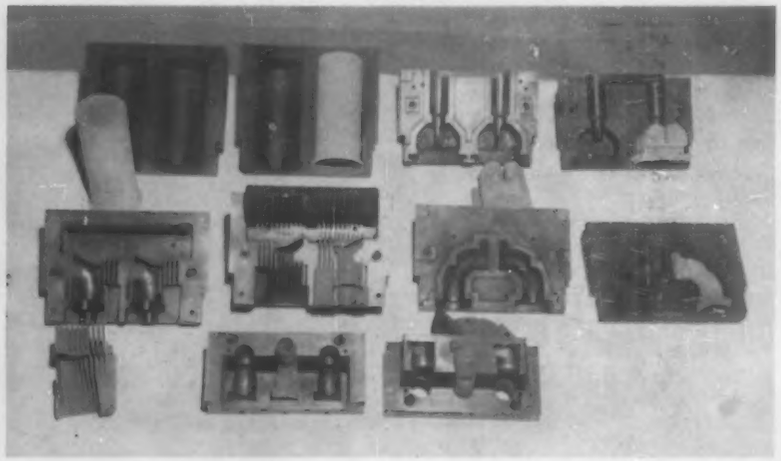
Boxes will occasionally have to be designed with irregular parting surfaces. No difficulty will be experienced with this provided that they are well constructed and that all joints fit together properly.

Loose pieces can be designed into the core box equipment where needed. It has been our experience that, because of the high operating temperatures involved, loose pieces are much easier to handle if they can be hinged or slid into place so that they need not be removed completely from the box.

Although blowing pressure is less, core box venting is as important as it is with dry sand practice, as good dense cores can only be obtained with proper placement of vents. The box joint and stripper pin holes will provide some vent area which should be taken into consideration in the box design.

Most of the boxes we have used have been built up with inserts to facilitate construction and future repair. Originally we were afraid that these pieces would work and loosen, but to date none of this difficulty has been experienced.

A Bibliography on Shell Molding has been prepared by the American Foundrymen's Society and may be purchased from MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.



Core box equipment is used with air cooled cylinder pattern at left.

Close the cope. Brillion has been a pioneer in the shell process.

PRECISION CASTINGS in a BIGGER WAY

Shaw process producing quality steel castings weighing up to 700 pounds with no apparent limit on size

ADAM DUNLOP / *Director*
Shaw Processes Ltd.

Fig. 2 Ability to handle changes in section are among the strong points of the process.

Production of precision steel castings weighing up to 700 lb has been accomplished in England using the ceramic mold casting technique or Shaw Process. This is one of the new methods developed seeking improved quality and better dimensional control.

Basically ceramic mold casting is an investment process, differing in that no wax or expendable patterns are used and molds are produced directly from suitable master patterns. It is not directly competitive with the lost wax investment process in commercial production but is regarded as complementary since the low end of the size range compares with the largest of the wax method.

Commercially the ceramic mold casting is used in producing castings of magnesium, aluminum, brasses and bronzes, cast iron, carbon and low alloy steels, tool steels and other highly alloyed steels and superalloys. Much of the production has been done in steel, with no apparent size limitation.

Process Principles

Metal, such as polished brass, is preferred for the pattern, but is not an absolute necessity. Other pattern materials such as wood and plaster are often used with satisfactory results, but it should be borne in mind that the final casting produced can be of no greater accuracy or surface than the pattern. The pattern incorporates the necessary allowances for metal shrinkage only, the final mold cavity being exactly the same size as the pattern.

The accuracy, smooth surface and high degree of soundness obtained in castings made by the process are due to the unusual properties of the mold material.

Fig. 1 Accuracy, smooth finish and degree of soundness are due to unique mold material which is flexible, stripped from pattern.

The mold material is prepared in the form of a slurry by mixing a suitably graded refractory filler with a hydrolyzed ethyl silicate solution to which a reagent is added to produce a carefully controlled gelling reaction. This mixture is immediately poured over the pattern and caused to gel. During this stage the mold is flexible and while in this condition the pattern is readily removed even when no draft is used. The gel time is under complete control, a suitable time being about one minute for small molds while for larger molds requiring longer mixing times, a gel time of about 5 minutes is more convenient.

Following stripping, the mold is ignited with a torch to burn off the volatile matter, alcohol, then assembled and fired at a red heat in a furnace. Cores are made in a like manner using conventional design of core boxes. The mold is now ready for casting. No volume change occurs during the ignition of the mold and this treatment gives rise to a mold surface covered in a fine system of craze-cracking. This crazing is progressive throughout the mass giving a mold of high permeability and immunity to thermal shock. The surface cracks are so fine, however, that no metal penetration occurs on pouring the molds, the smoothness of the casting surface being unimpaired. A hot or cold mold may be used, the choice depending on the design of the part being cast.

Mold pieces can be made in a matter of minutes and in an hour or two, depending on mold size, the finished mold may be ready for pouring.

Molding Methods

Typical examples of molding techniques are given in Figs. 1 to 4.

In Fig. 1 is shown a heat resisting steel gas turbine elbow. The two mold halves and core are included in the illustration together with the wood patterns and one half of the core box. The steel contains 25 per cent chromium, 12 per cent nickel, 3 per cent tungsten and 0.3 per cent carbon. This casting has a wall thickness of 0.128 in. and a weight of 3 lb. The as-cast weight with runner and riser is 8-1/2 lb. To run a section of such thinness the mold is preheated to 1500 F.

A nozzle casting in the same heat resisting steel is illustrated in Fig. 2, the thickness of the section being shown on the right where the core is fitted into one of the mold halves. This casting weighs 5 lb.

Fig. 3 shows a columbium stabilized 18/8 type corrosion resisting steel sediment trap casting together with the two mold halves, core,

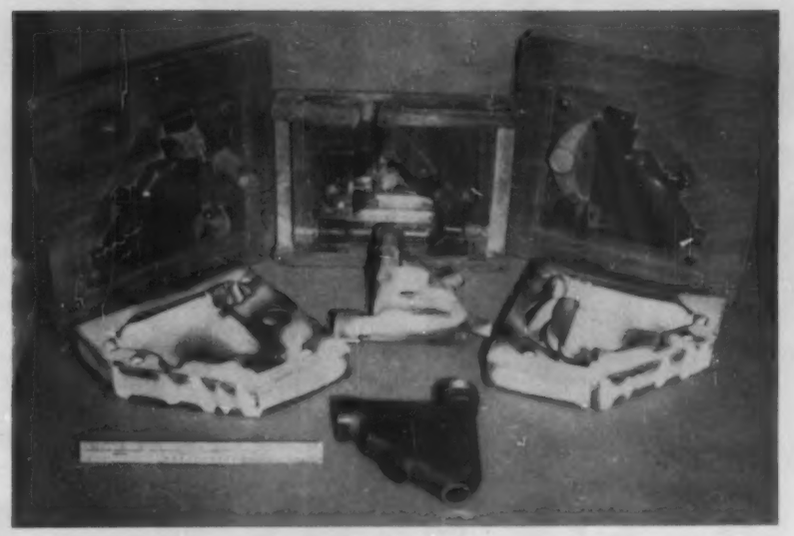


Fig. 3 Varying sections and changes in size are accomplished by the use of hot molds which assist in equalizing cooling rates.

wood patterns and core box. The casting weighs 7 lb and is a good example of thin walled intricately cored work. The casting has a wall thickness of 5/32 in. and is triangular in shape incorporating four cored bosses and an internal system of three baffles, which are 1/8 in. thick.

Figure 4 illustrates the mold construction which consists of 56 identical interlocking cores fitted between cope and drag sections. Two simple wood patterns were used to make the cope and drag parts while the core pieces were made from one core box. This is an excellent illustration of the high accuracy possible in core manufacture. As in the earlier examples, a hot mold was used.

Large Steel Castings

Two of the heaviest steel castings made to date weigh 760 lb and 500 lb and are components of a plastic molding die for radio cabinets. The steel used contains 12 per cent chromium and 2 per cent carbon.

Heavy castings are in current production in 12-14 per cent chromium, 0.2 per cent carbon steel for a variety of molds for glass ware manufacture. In a recent visit by the author to a steel foundry using the process he witnessed eight Shaw molds being cast requiring the total melt from a half-ton high frequency furnace. This is typical of that particular foundry's production of steel precision castings.

Precision cast forging dies weighing up to 100 lb are in production in alloy steel containing 2.0 nickel, 0.9 chromium, 0.25 molybdenum, and 0.5 per cent carbon.

Quality of Castings

As stated earlier, the high quality of the castings produced by the process stems from the unique characteristics of the material.

Surface smoothness of 80-125 micro inch is being obtained. Dimensional tolerances of ± 0.005 in. per in. on dimensions up to 3 in. with a minimum tolerance of ± 0.003 in. can be held. On dimensions over 3 in. in length an overall tolerance of ± 0.015 in. is possible.

The refractory nature of the mold filler together with the heat treatment applied to the ceramic pieces during manufacture and prior to casting produces a highly refractory and permeable mold completely free of all volatile matter and these factors contribute largely to the high degree of soundness produced in the castings.

Arising from the mold material's immunity to thermal shock and freedom from any tendency to spall on casting, it is often possible when pouring to dispense with the conventional runner system and pour directly down the riser. This technique used in conjunction with exothermic feeding compounds promote ideal thermal gradients in the cooling casting and resulting high density and freedom from porosity.

The use of hot molds makes possible the production of the finest detail. However, it has been our experience, even when casting heavy sections, that the use of a warm mold in conjunction with exothermic feeding produces castings of the highest density and freedom from porosity. This is reflected in the production of highly polished blemish-free surfaces with the removal of only a few thousandths of an inch of metal from the as-cast skin.

When castings contain widely varying sections, such as in the combustion chamber, the use of hot mold as well as facilitating the filling of the thin sections, assists in the equalization of cooling rate and the prevention of hot tearing.

Additional development of the Shaw Process may now be expected in the United States following the completion of a pilot foundry at Port Washington, N. Y. This operation, established by the Shaw Development Corp., provides complete facilities for licensing American foundries and training their personnel. Shaw Development Corp., recently organized by British Industries Corp., is the licensing agent for the process in North and South America. Instruction in the new pilot foundry will be provided by a staff of metallurgists and process engineers, skilled in all phases of foundry practice.

Acknowledgements

The author desires to express his thanks to Messrs. Darwins Ltd. and Messrs. Samuel Osborn Ltd., both of Sheffield, England and Werkspoor M. V., Amsterdam, Holland for permission to illustrate the paper by examples from their production and to *Machinery*, London for providing a number of the illustrations.

Fig. 4 Intricate castings are possible by the accuracy in core production through use of highly refractory and permeable molds.

committees in action

The Joint AFS-AWS Committee on Welding Iron Castings met in Annapolis with 13 members present. At this meeting the Committee arranged for an extensive cooperative program of welding and testing gray iron, ductile iron and malleable iron. The photo below shows 11 of the members "in session."

The Grading, Fineness and Distribution Committee and National Industrial Sand Assn. representatives met in Chicago, August 29, with 15 members and representatives present. W. D. Chadwick presented a color motion picture showing the results of a study of segregation of dry sand when loaded into silos and subsequently withdrawn from the bottom. By dyeing sand fractions and running sieve analyses, marked segregation was demonstrated as a function of the manner of loading and unloading the silo.

The Executive Committee of the Steel Division is proud to announce that one of its members, Clyde B. Jenni, has been honored by the Department of Commerce appointing him Chief of the Castings Branch, Iron and Steel Division, Business Defense Services Administration.

The Safety Committee met in Chicago, September 11 & 12, with eight members present. Culminating five years of intense effort, the committee completed revisions of the "Safe Practices Manual for the Protection of Workers in Foundries", published in 1940. The revisions have been turned over to the Steering Committee for final approval before printing the new Manual.

Continued from page 22

amount of each alloy poured and where used; the alloy record which shows the distribution of alloy additions; heat log which shows the condition of cupola and charges throughout the melt; heat data which gives pertinent information from other reports plus material inventory and melting time.

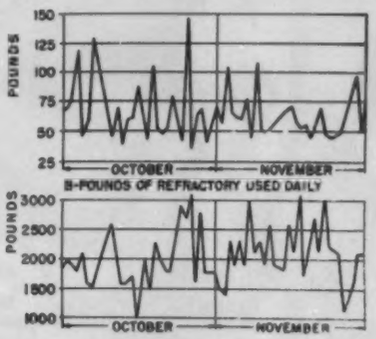


Fig. 3 Refractory consumption.

The information gathered from each shift is correlated in the control department and forms a permanent record showing the condition of production as well as pricing, estimating and overall capacity trends.

Permanent records maintained are:

1. A curve is plotted for the average volume of the cupola, indicating the volume of the melt and stack zone.
2. Average of metal temperatures at pouring spout.
3. Product of degree-minutes under 2750 F for curve of metal pour temperature each day (Fig. 2).
4. Average melt rate per hour.
5. Amount of refractory material used per day in terms of metal poured (Fig. 3).
6. Average temperature for each carload of coke.
7. Analyses of constituents of every ladle plotted and projected for every four tons of metal poured. This is done only during pouring.
8. Screen analyses of the sand mixes are plotted for each week.
9. Physical properties of the sand blends are plotted each week.

Advance Foundry Company feels that only by maintaining this control from raw material to finished casting, can the highest quality production at the lowest possible cost be achieved.

Training Future Foundrymen in CENTRAL MICHIGAN

JACK BUTTERS / *Editor, the Circle-a-tor*
Albion Malleable Iron Co., Albion, Mich.

■ It is still possible to get kids interested in the foundry and in Michigan the Central Michigan Chapter of the American Foundrymen's Society knows how to do it.

Four high schools in the central Michigan area have now installed foundry shop courses with the cooperation, advice, and often with financial assistance from the chapter. The chapter's education committee, now headed by Al Hensel, Albion Malleable Iron Co., spearheaded the efforts which brought metal casting labs to Marshall high school in 1956, Albion in 1955, and to Battle Creek and Charlotte within the past several years.

The Marshall foundry is located in one room of the school's new industrial arts building, and the instructor hopes to expand the facility. An interesting development at Marshall has been the interest shown by the younger boys, ninth and tenth graders. This same interest on the part of younger students has been in evidence at Albion, but not at Battle Creek where engineering drawing, lathe work, and finishing are more closely tied to the casting work.

The chapter encourages high schools to include metal castings in their curriculum and then helps the school to plan the shop and to obtain equipment. In the case of the foundry in the Marshall high school, Dave Boyd and Dave Sherman of Engineering Castings, Marshall, were instrumental in establishing the foundry. The chapter's interest in the program does not cease when the school installs the course. Periodic visitations, mostly informal visits, are made to the schools by chapter members.

With keen interest, youngsters place the drag into position. The practical shop experience gives boys an opportunity to undertake an actual project.

Melting is done by the pound rather than by the ton but the basic principles are the same. Four high schools have now added casting facilities.

The importance of safety is stressed, as shown by the use of protective equipment during the pouring operation. Much of the success of the program is due to the active participation of members of the AFS Central Michigan Chapter.

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Philadelphia 24

Tennessee—Robbins & Bohr
Chattanooga

Washington—Carl F. Miller & Co., Inc.
Seattle 4

Washington—Pearson & Smith Distributing Div., Spokane Pres-To-Log Co.
Spokane

Wisconsin—Interstate Supply & Equipment Co.
Milwaukee 4

Canada—Canadian Foundry Supplies & Equipment, Ltd.
Montreal, Quebec (Main Office) and Toronto, Ont.

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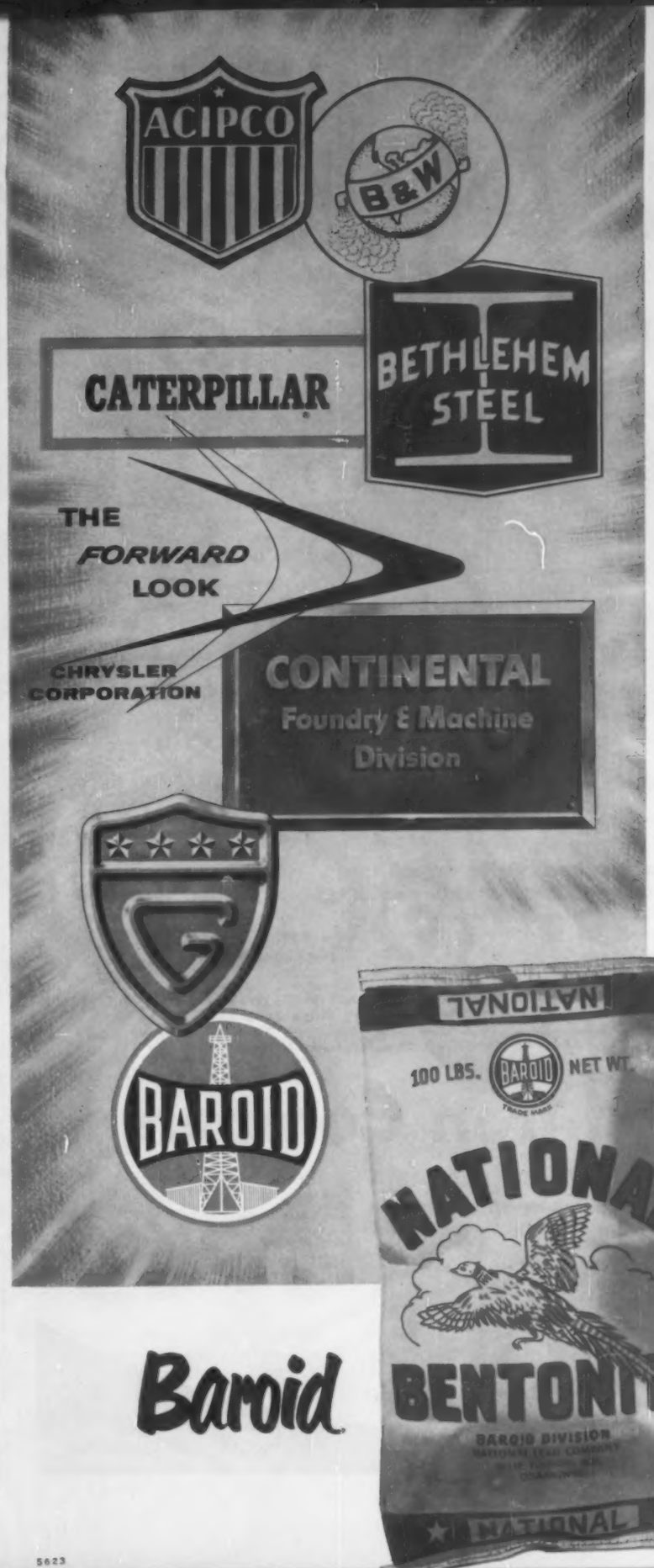

Baroid

NATIONAL BENTONITE .....their source for better bond

Big foundries . . . big users depend on National Bentonite to bond better molds, minimize sand problems and rejects.

They know they can rely on National Bentonite for uniform high quality . . . hot strength to resist erosion, washing and cutting... fewer blows, pin holes or rejects . . . less gas and steam to vent . . . castings that peel clean, shakeout with fine finish.

You can test National Bentonite's superior qualities. Write for sample.

NATIONAL BENTONITE

BAROID DIVISION • NATIONAL LEAD COMPANY

Bentonite Sales Office:

RAILWAY EXCHANGE BLDG. CHICAGO 4, ILLINOIS

Continued from page 25

Metropolitan

Chairman: Robert A. Colton, Federated Metals Div., American Smelting & Refining Co., Newark, N. J.

Vice-Chairman: Howard E. Voit, Sterling Wheelbarrow, Co., Hackensack, N. J.

Secretary: Seymour B. Donner, Ard Corp., New York.

Treasurer: William H. Ruten, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Directors: William T. Bourke, American Brake Shoe Co., Brake Shoe & Castings Div., Mahwah, N. J.; Whitney C. Russell, Springfield Facing, Inc., Harrison, N. J.; Robert J. Conroy, Reaction Motors, Inc., Denville, N. J.; Daniel J. Jones, New Jersey Silica Sand Co., Millville, N. J.; A. Blanche, Worthington Corp., Harrison, N. J.

Whitney C. Russell, 401 S. Second St., Harrison, N. J. is the membership chairman.

Northern California

Chairman: Harold E. Henderson, H. C. Macaulay Foundry Co., Berkeley, Calif.

Vice-Chairman: Harold R. Hirsch, American Manganese Steel Div., American Brake Shoe Co., Oakland, Calif.

Secretary: Davis Taylor, Wheelabrator Corp., San Carlos, Calif.

Treasurer: Fred A. Mainzer, Pacific Brass Foundry, San Francisco.

Directors: William Burt, Berkeley Brass Foundry Co., Berkeley, Calif.; Raymond Haun, San Francisco Iron Foundry, San Francisco; James S. Campbell, Jr., University of California, Berkeley, Calif.; Edward T. Morgan, Empire Foundry Co., Oakland, Calif.

Byron F. McDonald, 27 Ichabod Lane, Orinda, Calif. is the membership chairman.

Northwestern Pennsylvania

Chairman: Robert L. Johnson, Bucyrus Erie Co., Erie, Pa.

Vice-Chairman: Edwin J. Bonesteel, Malleable Foundry, General Electric Co., Erie, Pa.

Secretary: Wilbur R. Ferguson, Pickands Mather & Co., Erie, Pa.

Treasurer: Frank P. Volgstadt, Cleveland Flux Co., Erie, Pa.

Directors: Fred P. Harter, Corn Products Sales Co., Erie, Pa.; William C. Peelman, Erie Malleable Iron Co., Erie, Pa.; James J. Markowitz, Cascade Foundry Co., Erie, Pa.

O. C. Bueg, P.O. Box No. 1183, Erie, Pa., is the membership chairman.

Continued on page 59

foundry trade news

Swedish Crucible Steel Co. . . has announced a million dollar expansion program. Foundry additions include a 1½-ton electric furnace, automatic sand handling equipment, 1200-ton sand bin, 15-ton crane and laboratory facilities.

The Day Co. . . Minneapolis designers, manufacturers, and installers of dust control equipment has completed 75 years of continuous operation. Two plants are located in Minneapolis others in Buffalo, N. Y. Fort Worth, Tex. and in Canada at Fort William and Toronto.

Archer - Daniels - Midland . . has formed a company with Peruvian interests to operate a land-based whaling station in Peru. Sperm oil is used in detergents, wetting agents, hand soaps and rust-proofing compounds.

Frederic B. Stevens, Inc. . . has named the R. F. McGuire Co., Inc., Milwaukee as distributors in Wisconsin of their metal finishing equipment and supply line.

The Beryllium Corp. . . Reading, Pa., has been awarded a $24 million contract for nuclear grade pure beryllium by the Atomic Energy Commission. A $13 million contract had been received earlier in September from another source.

American Brake Shoe Co. . . has made a division of The Denison Engineering Co., Columbus, Ohio. It had been a wholly owned subsidiary since 1955.

Eisa Argentina . . Buenos Aires newly organized foundry supply firm will represent several American foundry equipment manufacturers.

National Malleable and Steel Castings Co. . . Cleveland, has been awarded contracts in excess of $2,600,000 by the State Railway of Thailand to supply equipment and modernize its rolling stock.

Basic Refractories Inc. . . will build a $400,000 distribution center in Hammond, Ind. Eight storage bins for dead burned dolomite will have a combined capacity of 1,000 tons.

U. S. Industrial Chemicals Co. . . division of National Distillers Products Corp. will put into operation by the end of 1957 a 10 million pound per year plant for titanium sponge production.

Horizons Inc. . . has received a Navy contract to develop a commercial method for producing virgin titanium metal by an electrolytic process.

Alco Products, Inc. . . Schenectady, N. Y., has opened a nuclear laboratory for use with its atomic-power development program.

J. I. Case Co. . . and American Tractor Corp., Churubusco, Ind., have announced plans for merging. This will give Case a broad entry into the construction and roadbuilding fields.

Crouse-Hinds Co. . . has formed a Wise Owl club. To be eligible one must have been saved from a serious eye accident through the wearing of safety glasses. The club has five charter members.

Acme Precision Products Co. . . Dayton, Ohio, replaces Acme Aluminum Alloys, Inc. as the corporate name.

Vanadium Corp. of America . . has transferred its engineering department to Cambridge, Ohio

Shell Process, Inc. . . has appointed Edwin A. Swensson Co. as Canadian representative for Western Ontario.

Olin Mathieson Chemical Corp. . . and Revere Copper & Brass, Inc. have jointly formed a $231 million company to produce 180,000 tons of primary aluminum yearly.

Union Carbide & Carbon Corp. . . will build a fabricated carbon products plant at Lawrenceburg, Tenn. to be operated by National Carbon Co.

The Magnesium Association . . shipments of magnesium castings in July were 1405 tons compared to 1475 in June.

American Smelting and Refining Co. . . will spend over $1,250,000 to expand its Perth Amboy, N. J. facilities for continuously casting bronze foundry alloys.

Chrysler Corp. . . Defense Operations Div. of corporation has joined Investment Casting Institute.

All-State Welding Alloys Co. . . White Plains, N. Y., manufacturer of alloys and fluxes for welding, has completed its fifth expansion since 1947.

Norton Company . . is building a 2 million dollar, two-story service build-

ing at Worcester, Mass. The factory and office building will cover 3½ acres.

Thompson Products, Inc. . . . the Accessories Division of this Cleveland firm has joined Investment Casting Institute.

The Griscom-Russell-Schack Co. . . . manufacturers of recuperators has opened new offices at 901 Ridge Ave., Pittsburg.

Garrett Corp. . . . Los Angeles reports sales for fiscal year ending June 30, 1956 were $138,981,762 with net profit of $5.13 per share compared to $4.10 per share for the previous year.

The American Baler Co. . . . Bellevue, Ohio has added production facilities for producing components for industrial ovens.

Holcroft & Co. . . . office of Chicago representative, A. A. Engelhardt, is now at 4935 W. Fullerton Ave.

Doesn't the shop have any dust collectors besides you?

Sand Adherence

Sand adherence to steel castings in the absence of metal penetration is promoted by (a) the production of an intimate mechanical bond by oxide penetrating and keying into the solid metal, (b) the formation by sand-oxide interaction of strong bonding materials. Obviously, this type of penetration can be stopped by preventing the oxidation of the solidifying metal – or by using a sand that does not interact with the metal oxide, or the contraction of the solid cast must be sufficient to break loose from the formed oxide. Indications are that zircon washes may be helpful in overcoming this defect.

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Ontario

Chairman: F. W. Kellam, Electro Metallurgical Co., Div. of Union Carbide Canada, Ltd., Welland, Ont.

1st Vice-Chairman: J. Perkins, Ford Motor Co. of Canada Ltd., Windsor, Ont.

2nd Vice-Chairman: J. M. Hughes, Stevenson & Kellogg, Ltd., Toronto, Ont.

Secretary: J. W. Wallace, Canadian Westinghouse Co., Ltd., Hamilton, Ont.

Treasurer: S. E. Robinson, John Bertram & Sons Co., Ltd., Dundas, Ont.

Directors: R. S. M. Gray, Canadian Westinghouse Co., Ltd., Hamilton, Ont.; J. Morgan, Services (Canada) Ltd., Guelph, Ont.; P. J. Provias, International Nickel Co. of Canada, Ltd., Toronto, Ont.; L. Humphreys, A. H. Tallman Bronze Co., Ltd., Hamilton, Ont.; R. A. Short, McKinnon Industries, Ltd., Niagara-on-the-Lake, Ont.

D. Magder, 363 Wellington St. N., Hamilton, Ont., is the membership chairman.

Oregon

Chairman: F. M. Menzel, Rich Mfg. Co., Portland, Ore.

Vice-Chairman: Harry K. McAllister, Western Foundry Co., Portland, Ore.

Secretary: Joseph W. Goehler, Central Brass & Iron Foundry, Portland, Ore.

Treasurer: Robert M. Burns, Pacific Chain & Mfg. Co., Portland, Ore.

Directors: John F. Oettinger, Electric Steel Foundry Co., Portland, Ore.; James W. Smith, Holt Equipment Co., Independence, Ore.

William R. Reilly, 1900 N.W. 18th St., Portland, Ore., is the membership chairman.

Quad City

Chairman: Lyle H. Brogley, International Harvester Co., Farmall Works, Rock Island, Ill.

Vice-Chairman: Mervin H. Horton, Deere & Co., Moline, Ill.

Secretary-Treasurer: John G. Smillie, Deere & Co., Moline, Ill.

Directors: Joel W. Luck, Manley Sand Co., Rockton, Ill.; Roger J. Hageboeck, Frank Foundries Corp., Moline, Ill.; Bailey R. Day, Moline Iron Works, Moline, Ill.

Edwin F. Peterson, Martin Engineering Co., Neponset, Ill., is the membership chairman.

the Shape of things

safety, hygiene, air pollution

by HERBERT J. WEBER

Chicken Coop Wire and House Flies

Once on a visit to a large steel foundry I walked into the cleaning room and noticed in the casting-repair-welding department a large sign which read "Main Foundry." The wit of the welder who made the sign was good.

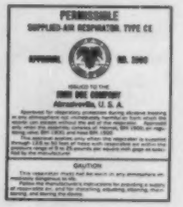
Then I noticed one of the welders working with a handkerchief tied over his mouth for the purpose of filtering the fume from the electric welding arc. His sense was not so good.

Now the mesh opening in a handkerchief is probably about 100 microns, (a micron is approximately 1/25000th inch) whereas the particle size of fume from electric welding is of the order of ½ micron. Thus to wear a handkerchief in place of an approved respirator is equivalent to screening a house against flies with chicken coop wire.

The same reasoning applies to substandard respirators which can be bought cheaper than approved types. The selection of the proper type of respiratory protective devices is important. The United States Bureau of Mines conducts a testing program in order to determine the effectiveness of respiratory protective equipment. Equipment meeting its rigid tests for efficiency, comfort, ease of breathing and the length of service is given an official approval number.

Where any respiratory equipment is used it should carry the Bureau of Mines approval for protection against the specific toxic or hazardous exposures in which the device is to be worn, as shown in the figure. Thus a respirator satisfactory for silica dust may be worthless for carbon monoxide.

Respirators should never be considered as suitable substitutes for proper exhaust ventilation. Actually men will not wear mechanical filter respirators continuously because they are forced to breathe against a resistance; and for work requiring exertion or where there is exposure to heat, a mechanical filter respirator is a cruel remedy. Furthermore, unless the respirator fits tightly, it is worthless. In my experience, this device may be defined as a muzzle-type ornament loosely hanging from the neck and worn on certain jobs to distinguish the laborers from the office employees.



If a respirator must be worn, except in unusual cases and for intermittent or casual jobs or on jobs that cannot be ventilated practically, it is an indictment of the working environment and an admission of unhygienic conditions.

On the other hand, I have seen men wearing respirators on jobs where there was no need to wear them—on jobs where the dust exposure was no greater than one would find on a city street on a windy day. Actually, in my experience respirators are worn more than they need be rather than not worn when they ought to be.

Certainly respiratory protective equipment has its place in any industrial hygiene program and the devices commonly in use in the foundry industry are as follows:

1) Mechanical filter respirators
2) Abrasive blasting respirators
3) Supplied air respirators
4) Gas masks
5) Chemical cartridge respirators.

The limitations and application of this equipment should be well understood if the money spent for it is not to be wasted.

new books

Legal Problems in Engineering . . Melvin Nord. 391 p. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. 1956. $7.50.

This book covers almost every legal subject bearing on engineering, with a view to helping avoid legal action in the first place, and permitting effective collaboration with lawyers should difficulties eventually arise.

Specific points covered are: contracts, sales, negotiable instruments, insurance, personal property, real property, torts, workmen's compensation, agency, business organizations, municipal corporations, labor law, ethical responsibilities of engineers, professional registration of engineers, construction contracts and specifications, governmental regulations of business, patents, copyrights, trademarks, and air and stream pollution.

Phase Diagrams for Ceramists . . Ernest M. Levin, Howard F. McMurdie, and F. P. Hall. 286 p. American Ceramic Society, 4055 N. High St., Columbus 14, Ohio. 1956. $10.

Approximately 800 diagrams designed to serve the needs of the majority of workers in the broad field of ceramics. The book includes a glossary, a selected annotated bibliography, author index and system index.

Resistance Welding—Theory and Use . . Resistance Welding Committee, American Welding Society. 163 p. Reinhold Publishing Corp. 430 Park Ave., New York 22, N.Y. 1956. $4.50.

Handbook for welding the thinner gauges of all kinds of metals. Newest developments such as slope control and the welding of aluminum are discussed.

Metal Finishing Guidebook (1956 ed.) . . 606 p. Finishing Publications, Inc. 381 Broadway, Westwood, New Jersey. 1956. $3.50.

Chapter headings read as follows: Finishing Plant Engineering, Mechanical Surface Preparation, Chemical Surface Preparation, Plating Solutions and Operating Data; Special Plating Procedures; Special Surface Treatments; Control—Analysis—Testing; Tables and Data Sheets; Directory of Suppliers and Manufacturers by Product Classifications; Trade Names; Alphabetical Listing of Suppliers and Manufacturers with Addresses; Reference List of Books; Metal Finishing Consultants; Engineering Societies in the Electroplating Field; and Schools for Electroplating.

Foundation Engineering . . Rolt Hammond. 192 p. Philosophical Library, Inc., 15 East 40th St., New York 16, N.Y. 1956, $10.

Discusses soil mechanics; site exploration; piled foundations; vibration-controlled foundations; foundations for houses, buildings, bridges, and maritime structures; and difficult foundation problems. Reference at end of each chapter.

Cast-Brass Solder-Joint Drainage Fittings . . 21 p. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N.Y. 1955.

Standard for cast-brass solder-joint drainage fittings for use with copper water tube, covers Description, Pitch (slope), Abbreviations for end connections, Sizes, and method of designating openings for reducing fittings, Marking, Minimum Requirements for material, and Dimensions and tolerances.

Manganese Steel . . 128 p. Hadfields Limited, Sheffield, England, 1956, 18s.

The story of the conception and development of manganese steel. The general characteristics and properties, manufacture, machining, welding, and industrial applications are among the subjects covered. Bibliography.

Metallurgical Thermochemistry . . (2d ed.) O. Kubachewski and E. LL. Evans. 410 p. John Wiley & Sons, 440 Fourth Avenue, New York 16, N.Y. 1956. $10.

The first section of the book discusses the theoretical basis, and consists largely of formulas necessary for applying fundamental data to reaction problems. Following this, the authors describe the main experimental techniques used to determine the thermochemical data, and point out the relative advantages and disadvantages of the various methods.

A third section describes methods of estimating values that cannot ordinarily be determined. In Part 4, the authors supply, in tabular form, the values of thermochemical constants for a large number of elements and compounds of possible metallurgical importance. The final section of the book contains examples of the practical applications of thermochemical methods.

Noise, Its Measurement, Effects and Control . . 364 p. 2336 ref., Industrial Hygiene Foundation of America, Inc., 4400 Fifth Avenue, Pittsburgh 13, Pa. 1955.

An annotated bibliography intended for engineers, executives, physicians and others who may be concerned with problems resulting from excessive noise. Broad subjects covered include I, Measurement of Sound and Noise; II, Effects of Noise, III, Measurement of Hearing Loss; IV, Reduction and Control of Noise.

Safety Management—Accident Cost and Control . . Rollin H. Simonds and John V. Grimaldi. 553 p. Richard D. Irwin, Inc., Homewood, Ill. $7.80.

Written as a college textbook for courses in accident prevention and safety administration and to provide some new ideas in certain areas and a general coverage of the basic principles of accident prevention and cost analysis for the practicing safety specialist. The book provides a comprehensive survey of safety management in which many suggestions and procedures are presented in book form for the first time. Particularly new and useful is the section on accident cost analysis in which the most recently developed method of estimating uninsured costs, replacing the old 4 to 1 ratio, is fully explained, together with supporting statistical data and suggestions for using cost figures in securing management backing for safety programs. Appendixes list common industrial hazards, their occurrence and properties, and properties of selected flammable materials.

Metal Industry Handbook and Directory —1956 . . No. 45. 492 p. Illife and Sons, Ltd., Dorset House, Stamford St., S.E.1, London, England. 1956. 15s.

The Handbook portion is divided into three sections: I, General Properties of Metals and Alloys; II, General Data & Tables; III, Electroplating and Allied Processes. The Directory (Section IV) contains a list of British trade names for the non-ferrous industry as well as information about various organizations in the British Metals Industry.

The Mechanical Properties of Wrought Phosphor Bronze Alloys . . G. R. Gohn, J. P. Guerard, and H. S. Freynik. 114 pp. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., 1956. $3.

ASTM Special Technical Publication No. 183 shows the effect of cold-working on the mechanical properties of a series of eight phosphor bronze alloys in two conditions in the form of cold-rolled

strip with varying tin content from 0.5 to 10 per cent. Electrolytic tough pitch copper strip similarly treated is included to provide a base for evaluating the effectiveness of the tin additions. 10 references, 95 figures.

The Non-Ferrous Metal Industry in Europe. 92 pp. Organization for European Economic Cooperation, Publication Office, 2000 P Street, N.W., Washington 6, D.C. 1956, $1.

Describes situation in late 1954 and first half of 1955. For prices information extended to November 1955. After a general review of the situation of the non-ferrous metals markets during the period of review there are market and price studies for each metal (aluminum, copper, lead, zinc, tin, and nickel). Conclusions give the principal problems of each metal.

NANCY PURUCKER, *Librarian*
American Foundrymen's Society

Award Honors Safety Service

■ MODERN CASTINGS' extensive coverage of safety problems in foundries has won it the 1955 Public Interest Award of the National Safety Council. MODERN CASTINGS is the only magazine in the metals field to receive the award, although a number of industrial magazines in other fields were similarly honored.

The award was given to MODERN CASTINGS "to recognize and honor exceptional service to safety in the public service field," said the National Safety Council. The service rendered by MODERN CASTINGS "reflects leadership, initiative and originality. And it means a continuous —not a sporadic—effort."

J. H. Schaum, editor of MODERN CASTINGS, who received the award from L. C. Smith, head of the Metals Section of the National Safety Council, said that the superior articles for which the magazine was honored reflected the activities of the Safety, Hygiene and Air Pollution program of the American Foundrymen's Society.

"The Safety, Hygiene and Air Pollution Control Steering Committee of the AFS, with J. R. Allan, chairman and K. M. Smith, vice-chairman, and the entire SH&AP program under H. J. Weber, director, produced a great deal of the material for which we were honored," Schaum explained.

"The cooperation between a technical society and its official magazine was never better demonstrated than in this instance."

Among special efforts of the magazine in the past year have been 16- to 32-page bonus sections on foundry environment, noise control and air pollution—all bearing on the general field of safety.

Editor Schaum, left, with C. G. Fuller, accept public interest award.

patent review

MELVIN NORD, *Dr. Eng. Sci., LL. B*
Consultant in Law and Engineering

Continuous Metal Casting

U. S. 2,740,177, issued April 3, 1956 to John S. Smart and assigned to American Smelting and Refining Co., provides a process for continuous metal casting in which an improved surface is obtained.

A graphite mold provided with a water jacket, is supported on legs which are in the water tank. Molten metal is supplied from a tilting furnace and launder. A pool of molten metal is maintained in non-turbulent condition. The casting is withdrawn by rolls, passing through the water tank. To minimize contact of metal with air, a layer of powdered material is maintained on the molten metal. This also serves to break the fall of the stream of metal into the pool, thereby reducing turbulence in the pool.

The casting is withdrawn intermittently in rapid, short strokes of about ½-in. While the mold is stationary, the outer surface of the metal in the chill section quickly forms a shell which is impervious to the low-melting constituents, before they can bleed to the outer surface. This produces a smoother surface.

Any material may be cast in this way, but the method is especially effective in the case of copper and copper-brass alloys.

Gating System

U. S. 2,735,147, issued February 21, 1956 to Friedrich Nielsen, relates to a gating system for pouring molten metal, especially light metals, into a mold.

A covered runner is used which has a number of straight sections connected to each other by sharp bends and which wideas from the inlet to the outlet gate. Preferably the runner has right angle turns so that as the metal flows around each turn there is an impact loss of energy and a corresponding decrease in velocity.

Each successive section between bends is proportionately increased in width and cross-sectional area so that a uniform volume of flow is maintained through the runner. Consequently, the molten metal can be discharged from the runner at a velocity which will not cause disturbances in the mold, and at the same time the cross-section of the runner is kept small enough so that the surface of the metal will not oxidize to an objectionable extent.

Continuous Cast in Green Sand

U. S. 2,742,682, issued April 24, 1956 to Pearson M. Payne, provides for the continuous casting of metal in green sand molds.

The method consists of continuously forming and moving a green sand mold drag, intermittently and automatically patterning and compressing successive sections of the drag in synchronism with the drag travel, successively associating mold cope portions with the packed sections of the drag to complete the molds, and feeding molten metal to the molds.

Shell Molding Apparatus

U. S. 2,741,005, issued April 10, 1956 to Roschild Hurst and assigned to Ford Motor Co., provides a method of avoiding the tendency of underheated portions of sand to produce defective castings.

A sand box accommodates the pattern plate at the top. A screen is placed in the box, secured by bolts. A weight is secured to the bottom of the box by a chain and bolt.

In this design, the presence of a screen prevents lumps which form in the sand from passing through onto the pattern when the sand box is inverted. A weight serves to prevent adhesion of the fine sand to the walls and bottom of the box when it is inverted, thus quickly showering the pattern with sand. It also breaks up lumps of sand which may form.

Shakeout Device

U. S. 2,741,815, issued April 17, 1956 to Charles M. Young, Jr. and assigned to Link-Belt Co., describes a fully automatic machine for removing the sand and castings from mold flasks having permanent grid bars in the drags.

The machine removes poured and cooled mold flasks from a continuously moving mold conveyor, inverts the flasks, and finally transfers the empty flasks to a conveyor which carries them away.

Heat Disposable Pattern

U. S. 2,741,817, issued April 17, 1956 to William G. Wilkins and assigned to Universal Castings Corp., describes a method of making one-piece plaster cores for casting multi-blade wheels.

The core is formed around patterns made of a 55-45 alloy of bismuth and tin.

Other Patents

U. S. 2,733,488, issued February 7, 1956 to Emery I. Valyi describes apparatus for producing shell molds.

U. S. 2,733,489, issued February 7, 1956 to Eaton Manufacturing Co., describes machine for shell molds.

U. S. 2,733,912, issued February 7, 1956 to Rem-Cru Titanium, Inc., describes vacuum furnace batch feeding apparatus.

U. S. 2,734,738, issued February 7, 1956 to Nicholas Even, describes cupola tuyere gates with integral downward deflectors.

local foundry news

Constant rain failed to dampen the spirit of these **Philadelphia** Chapter members being chair-lifted during their annual summer outing.

PHOTO BY BOB DE BROUX, MILW. CHAPLET & SUPPLY

Directors of the **Wisconsin** Chapter at the first meeting of the board: J. McBroom, Stainless Fdy. & Eng.; H. W. Stokes, Kilbourn Pattern Co.; E. M. Soboda, Wis. Electric Power Co.; C. A. Gehrman, Sterling Wheelbarrow Co.; J. A. Arter, Ampco Metal Inc.; B. H. Booth, Carpenter Bros. Inc.; N. N. Amrhein, Federal Malleable Co.; G. J. Barker, University of Wis.; L. J. Woehlke, Grede Foundries Inc.; T. H. Tanner, Zenith Foundry Co.; R. W. Heine, University of Wis.; A. Pfieffer, Allis Chalmers Manufacturing Co.; L. J. Andres, Lawran Foundry Co.

Quad-City Chapter Chairman Lyle Brogley makes award to retiring chairman C. C. Fye.

CALMO ENG. CO. PHOTO

These happy types were among 500 at **Southern California** Chapter's annual summer event.

Col. W. F. Rockwell addressed **Pittsburgh** Chapter's first meeting for the fall season. The subject of his talk was government business controls.

Over 200 foundrymen from the U.S. and Canada attended the Dietert-Detroit Sand School this year. Highlight of the course was a foundry tour at Cadillac Motor Car Division.

ELECTRIC STEEL FDY. CO. PHOTO

"Robinson night" in Cleveland featured a man who doesn't play for either the Indians or the Browns, L. P. Robinson of Archer-Daniels-Midland. Ray Fleig presented this plaque for the **Northeastern Ohio** Chapter and Robinson reciprocated by telling all the members "How to Lose Money On A Modern Chicken Farm."

Oregon Chapter members were told how current developments are ". . turning a craft into an engineered metallurgical process." Frank S. Brewster of the Brumley-Donaldson Co. was the featured speaker.

Daniel R. Chester, Archer-Daniels-Midland Co., gave **St. Louis** Chapter members a look at the pros and cons of cold setting core binders.

The **Central Ohio** Chapter got four basic facts about people from their lecture by Ralph Lee of the Lee Hobby Foundry.

The first fall meeting of the **Northern California** Chapter brought out 120 members to hear F. S. Brewster talk on molding developments.

When the speaker doesn't show, what then? Here is one answer as it was reported by Ben Avery, **Tri State** Chapter.

The work-time noise of the office dropped away when the clock touched four-thirty. Ed O'Brien sat for a moment thinking of the AFS meeting scheduled for that night. Well he had a good speaker, Herbert Weber from the AFS national office. Can't beat that.

The telephone's sharp sound cut across the silence of the office. "This is Chicago calling for Mr. Edward O'Brien." For just a second Ed had a temptation to tell the operator that O'Brien was out. Then in a moment he was saying, "Mr. Weber? Grounded in Chicago? Oh." The evening fell apart. But then, footsteps along the hall. Ed waited. "Bill."

The name stopped that man as he was passing the door. It was William Smith, the plant engineer. "Bill, what are your plans for tonight?"

"Nothing in particular, Ed. Why?" "How 'bout handling the speaker's job at our first AFS meeting." The pressure was on. "Well, I . . ."

"Fine. Blue Room at the Alvin, seven-thirty."

That was the way it happened and Bill Smith (photo) presented an excellent talk on plant noise control and the chapter got off to a good start.

obituaries

William B. Coleman, 68, president, W. B. Coleman & Co., Philadelphia, passed away September 30.

A long-time foundryman, Mr. Coleman began his career in the industry at the Midvale Steel Co. in their laboratories after graduating from the University of Pennsylvania. In 1918 Mr. Coleman became superintendent, Tacony Ordnance Corp., and at the same time served as civilian consult-

W. B. Coleman

ant, Ordnance Dept., Washington, on the manufacture of steel for gears. After the war, the Tacony Corp. became one of the companies of the Penn Seaboard Steel Corp., and Mr. Coleman remained as general superintendent of that plant until 1922. At this time he organized W. B. Coleman & Co., a firm conducting analytical, chemical, and metallurgical laboratories, at the same time consulting on the manufacture of steel and operation of foundries and power plants.

Mr. Coleman was a director of the American Foundrymen's Society, Class of 1942, and a past chairman and secretary-treasurer of the Philadelphia Chapter. He was also a past president of the American Society for Metals and a member of the American Chemical Society and AIME.

M. J. Rice, 54, vice-president, General Products Div., Whiting Corp., died recently after a brief illness. He had been associated with Whiting almost 30 years.

Robert B. Pogue, 67, consulting engineer and former vice-president for engineering, Brake Shoe & Castings

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foundry facts

Melting / Crucible Hardware

■ Proper fitting, well-designed hardware will prolong crucible life and promote safe foundry operations. To be correctly fitted, tongs must: clear the edge of the crucible without pinching, bear evenly against the crucible sides, have bottom blades contact crucible below the bilge to effect a lifting rather than a squeezing hold, be checked at regular intervals for proper fit and be lowered gently and positioned properly on the crucible when lifted from the furnace, Fig. 1.

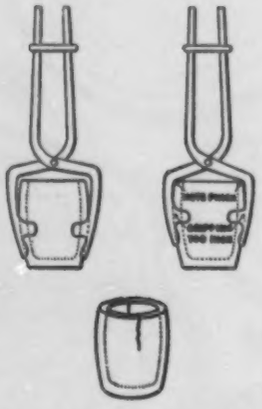


Fig. 1 Design and proper fit will increase wearing.

Tongs, Shanks & Ladles

The most commonly used tongs have double prongs (Fig. 2) and are called the grab or claw type. Other types of tongs with single prongs are designed to support the crucible in the same manner as the pouring shank. Another type which insures no squeezing action against the upper crucible wall is the cradle tong, Fig. 3.

Shanks consist of a rigid, steel ring with steel rods extending from opposite sides of the outside diameter to serve as carrying handles. Shanks should be designed to fit the crucible and to allow the crucible to rest in the shank so that the point of contact is just below the bilge to insure proper balancing when pouring. A safety hook should be fastened to the shank and extend over the top edge of the crucible to prevent it from tipping. Shanks should be checked frequently for roundness and proper taper, Fig. 4. If shims are used to compensate for crucible wear they should be flat metal pieces shaped to the contour of the shank ring and evenly spaced for support.

Ladles are used to transfer molten metal from the furnace to the pouring station. Where larger ladles (other than hand ladles) are used for carrying and pouring molten metal they are a steel shell into which a graphite ceramic-bonded or graphite-bonded ladle liner is placed with suitable insulation installed between the liner and the shell, Fig. 5. This type of ladle is carried in a shank. A layer of plastic refractory is applied over the top of the clay to retain it. The liner assembly prevents rapid temperature drops. The graphite ceramic-bonded or graphite carbon-bonded liner with insulation is preferred over a rammed-in refractory lining.

Fuels and Burners

The most popular fuels in crucible furnaces are gas and oil. Industrially three types of gas are used: natural gas, 800 or more BTU per cu ft; manufactured gas, 400 to less than 800 BTU per cu ft; and liquified petroleum gases such as propane and butane. Advantages of gas include closer atmosphere control, cleanliness, elimination of storage tanks and lower maintenance cost of burner and accessory equipment.

Standard crucible furnaces generally use No. 2 oil with about 140,000 BTU per gal. This is easy to control in either air atomizing or oil pressure atomizing burners.

Two types of burners are used. The sealed type is buried in the lining of the furnace and protected by a refractory tunnel or tuyere. It is the most common and permits better control of the air-fuel mixture and the furnace atmosphere as only primary air from the blower is used for combustion. The gas type burner is not recommended because control of furnace atmosphere is difficult since the secondary air continues to flow through the opening when the burner is turned down or shut off, tending to cool the furnace.

In conventional crucible furnaces the burner is located in the bottom of the centerline approximately on the same level as the top of the crucible base block. It should fire on a tangent to the inside of the furnace wall. An average of 2-1/2 in. clearance at the bilge

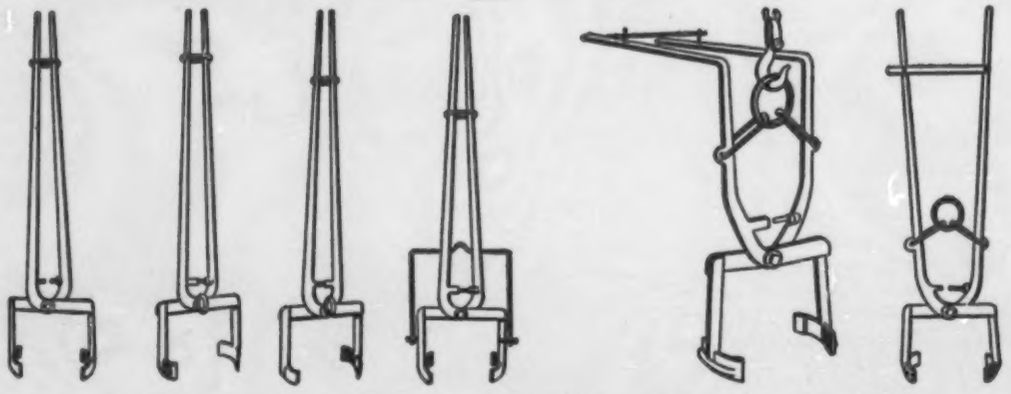


Fig. 2 Tongs most commonly used are the claw or grab type with double prongs.

foundry facts

Melting / Crucible Hardware

of the crucible and a minimum clearance of 2 in. between the underneath side of the furnace cover and top of the crucible is recommended. A base block 4 to 7 in. high will provide proper over-all combustion area, assuming that the proper size crucible is used. Vent areas depend on furnace input and should be based on 25,000 to 30,000 BTU's liberated per sq in.

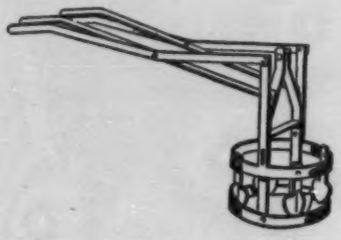


Fig. 3 Grade type tong insures against squeezing.

The air pressure depends on the type of burner used. Oil burners using air pressure to atomize require 16 oz of air pressure and 20-35 lbs oil pressure.

Furnace atmospheres are classified in three ways: *neutral*, with complete combustion and no free oxygen; *oxidizing*, with an excess of oxygen in products of combustion and *reducing*, with an excess of carbon monoxide and hydrogen.

The ideal atmosphere in a crucible melting furnace is 0.5 per cent oxygen. This will eliminate gas porosity which often is apparent when copper and aluminum alloys in the molten state are exposed to reducing atmospheres.

Determining Atmospheric Conditions

Four methods are commonly used for determining atmospheric conditions.

1. The flame test. It is commonly used on oil fired crucible furnaces. A long, smoky-yellow flame indicates a reducing atmosphere (excess fuel). This can be changed by reducing fuel so that the flame becomes shorter and incandescent with only a trace of the straw-yellow color.
2. The zinc test. Hold a small piece of cold zinc about 2 in. above the molten metal for 10 sec, if the zinc is dark or a black carbon deposit is found, the atmosphere is reducing. Decrease fuel or increase air until a grayish deposit is observed on the zinc.
3. The skimming test. After skimming, observe the metal surface. If it is bright and shiny, a reducing atmosphere exists. Adjustment of either fuel or air to give a dull, skimmed metal surface indicates a slightly oxidizing atmosphere.
4. The Orsat test, a gas sampling with Orsat apparatus. An actual determination is made of the percentage of carbon dioxide, carbon monoxide, and oxygen present in the products of combustion. This test gives definite proof of correct furnace atmosphere.

Automatic proportioning equipment is available for either gas or oil fired crucible melting furnaces. The correct proportion of fuel and air remain constant throughout the range of operation, once the equipment is set for the atmosphere required. This equipment eliminates the guess work of maintaining proper furnace atmosphere and generally is recommended by the furnace manufacturers.

The decision on how much ventilation is necessary will depend on individual conditions and will be influenced by geographic location, types of metals melted, pouring temperatures and local ordinances. All elements can not be removed so the aim should be to dilute them.

Air contamination in industrial areas is being subjected to greater control at the local level. Therefore local restrictions must be considered when installing a ventilation or exhaust system.

Fig. 4 Shanks must fit crucible for best balance.

After determining the required degree of ventilation and requirements of local ordinances, the sources of products to be removed should be considered. Primary sources of heat and fumes are from melting furnaces, skimming stations, ladle heating stations, movement of molten metal between stations, shakeout, sand handling and cleaning and grinding.

Fig. 5 Large ladles need liners.

The next step is to evaluate the advantages of the various methods of handling the dust and fumes. Basically there are two types of ventilating or exhausting, the gravity exhaust system and inducing air flow by a fan. In many cases adequate exhausting can be economically obtained by the natural gravity movement of the warm gases to the roof area where suitable vents or stacks are installed. This type of system is not satisfactory where there is a back draft. A refinement of this simple system would be to provide between the area of fume and heat generation and the balance of the building a curtain wall which would direct the gases to the roof area. In the forced draft exhaust system the air flow is induced by a fan. The fan can be adapted to force air flow under positive pressure or to induce air flow by negative pressure.

Exhaust hoods are utilized for exhausting air at localized spots. The design of the hood will vary with the metal melted, type of furnace, method of charging and other factors. Flared hoods are often used. They require relatively large exhaust volumes and frequently are inadequate because of other considerations. Natural or mechanical draft may be employed.

Movable member type hoods provide more effective enclosure and are designed to permit access to the furnace either by means of a sliding door or other movable part.

Condensed from "Foundry Facts by Crucible Charlie" prepared by Crucible Manufacturers' Association for Modern Castings.

Div., American Brake Shoe Co., died suddenly September 26. He was a member of the American Society of Mechanical Engineers and the Engineers' Club.

Thomas F. Butler, 67, recently engineering consultant for the Claude B. Schneible Co., Detroit, passed away September 28.

A graduate of the University of Kentucky, he began his career with American Bridge Co. as a construction engineer. Five years later he joined Ford Motor Co. as a construc-

T. F. Butler

tion engineer and then went on to the Plant Engineering Dept. where he remained in a major capacity until his retirement in February 1954.

He joined the Claude B. Schneible Co. as engineering consultant in March of 1954, and in June of 1955 entered business for himself in equipment sales operating out of his birthplace, Hinton, Kentucky. Mr. Butler was an active member of AFS and ESD.

Joseph G. Tabor, general manager, Racine Foundry & Manufacturing Co., Detroit, died suddenly August 31. He was an active member of the National Foundry Association.

John Thomas, former vice-president in charge of engineering, Alco Products, Inc., New York, died suddenly of a heart attack August 31.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 13-14. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

for the asking

High speed motion pictures and their application to engineering problems is covered in five illustrated case histories in 12-page pamphlet F1-2. Also covered are facts on lighting, speed selection and lenses. *Eastman Kodak Company.*

CIRCLE NO. 61, PAGE 13-14

Binding agent, Kold Set, is described in technical bulletin No 2., four-pages. Information includes performance data, product description and tips in production core making. *G. E. Smith, Inc.*

CIRCLE NO. 62, PAGE 13-14

CO_2 process products are explained in technical bulletin FP-130. Four pages contain information on release agents, core pastes, mudding compounds, additives, binders and core and mold coatings. *Frederic B. Stevens, Inc.*

CIRCLE NO. 63, PAGE 13-14

Silicate solution Adcosil which is water based is said to have greater thaw stability than normal silicates. Best suited for short to intermediate production runs. *Archer-Daniels Midland Company.*

CIRCLE NO. 64, PAGE 13-14

Electric motor catalog No. GEC-1026-A covers fractional motors, integral-horsepower polyphase induction models, integral single-phase induction series, motors and controls for part-winding starting, resilient-base integral-horsepower induction motors and gear motors. All covered in 11 pages. *General Electric Company.*

CIRCLE NO. 65, PAGE 13-14

Sand screening unit known as Screenmaster, is described in bulletin 525, four pages with pictures, diagrams and applications. It may be interlocked with other units. *National Engineering Company.*

CIRCLE NO. 66, PAGE 13-14

Lithium cartridges for the treatment of copper and copper-base alloys are covered in four-page bulletin which outlines porosity in castings, lithium metals, metallurgical applications. *Lithium Corporation of America, Inc.*

CIRCLE NO. 67, PAGE 13-14

Zircon washes for all sand cast metals poured at above normal temperatures are described in four-page bulletin. *Delta Oil Products.*

CIRCLE NO. 68, PAGE 13-14

Buyer's Guide provides information and descriptive data on raw materials and products handled including abrasives, coals, coke, fluxes, pig iron, sand, clays, refractories and ferro-alloys. *Hickman, Williams & Co.*

CIRCLE NO. 69, PAGE 13-14

Flasks, bottoms and upsets are described in two-page bulletin complete with pictures. Cherry lumber is used with malleable trimmings. *The Adams Company.*

CIRCLE NO. 70, PAGE 13-14

Foundry equipment Cat. No. 69 includes 58 pages with illustrations, product applications, dimensions and

cutaways. Spiral binding makes this book easy to read. *Sterling Wheelbarrow Co.*

CIRCLE NO. 71, PAGE 13-14

Centerless brush finishing with grinding machines is discussed in Bulletin COC284, which includes specifica-

tions and pictures of brushes which may be interchanged with grinding wheels. *The Osborn Manufacturing Company.*

CIRCLE NO. 72, PAGE 13-14

Lithium product data catalog 201-656, six pages, includes physical, chemical properties, uses, availability, packaging, handling and shipping regulations. *Lithium Corporation of America, Inc.*

CIRCLE NO. 73, PAGE 13-14

"Foundry Cleaning News", a two-page news-type publication lists case histories of equipment in use. Pictures are incorporated into the articles. *Wheelabrator Corporation.*

CIRCLE NO. 74, PAGE 13-14

Sand conditioner is self-propelled, self-loading requires single operator; gives complete sand preparation on floor; and comes in 3 sizes, from 35 to 60 tons per hr. *States Engineering Corporation.*

CIRCLE NO. 75, PAGE 13-14

Resins for a rapid curing core binder, cold coating of sand and a cold setting organic binder are described in technical bulletins F-9, F-10 and F-11. Each lists composition, characteristics, advantages and method of use. *Reichhold Chemicals, Inc.*

CIRCLE NO. 76, PAGE 13-14

Objectives, progress, services, results and benefits are basis for "Let's Look Ahead", a 12 page booklet published by *Foundry Educational Foundation.*

CIRCLE NO. 77, PAGE 13-14

Leaks in pipe line may be repaired without shutting down. SmithxClamp is explained in four-page brochure with illustrated instructions. *Pipe Line Development Company.*

CIRCLE NO. 78, PAGE 13-14

Aftercooler system is said to eliminate moisture in compressed air lines. It is described in four-page bulletin with illustrations and specifications. *Jas. A. Murphy & Co., Inc.*

CIRCLE NO. 79, PAGE 13-14

Crane operating and hitching manual 25E6208C has 75 pages with instructions in safety rules and practices. It is well illustrated with drawings and photos. *Allis-Chalmers Manufacturing Company.*

CIRCLE NO. 80, PAGE 13-14

Tool room grinding handbook consisting of 222 pages is a compilation of three former books. Includes sections on tool grinding, carbide tools

and cast alloy tools. An authoritative and handy reference book. *Norton Company.*

CIRCLE NO. 81, PAGE 13-14

Shell molding manual, 28 pages, describes the technique. Products included are phenolic shell molding resins, silicone release agents and phenolic bonding resin. *General Electric Company.*

CIRCLE NO. 82, PAGE 13-14

Mold and core coating, zircon base, is outlined in one-page technical bulletin F-129. It has fusion point of 4000 F with Baume range of 65 to 75 or higher. *Frederic B. Stevens, Inc.*

CIRCLE NO. 83, PAGE 13-14

Cupola dust controller, the Amerclone, operates on dry-type centrifugal collection principle, Bulletin 292, four pages. Counterweighted caps are added to cupola tops and stack gases are pulled through damper section where initial flash cooling occurs. *American Air Filter Company, Inc.*

CIRCLE NO. 84, PAGE 13-14

Magnesium alloy dust and fume collection and control by the wet method is covered in eight-page brochure. Included are hazards, role of collection systems, safety measures, disposal methods, advantages of using water for precipitating and exhausting magnesium dust from grinding and polishing stands. *Peters-Dalton, Inc.*

CIRCLE NO. 85, PAGE 13-14

High pressure molding machine for diaphragm molding is discussed in 12-page bulletin which includes pictures, operating features and plant layouts. *Eastern Clay Products Dept., International Minerals and Chemical Corporation.*

CIRCLE NO. 86, PAGE 13-14

Control panel bulletin GEA-6334 contains application information and lists special Pan-A-Trol benefits. Descriptive data covers types of devices for typical packaged control. *General Electric Company.*

CIRCLE NO. 87, PAGE 13-14

Marking machines brochure FGP 200, four pages, covers equipment from light-duty bench units to heavy-duty automatic machines. Material includes pictures, specifications and descriptions. *Jas. H. Matthews & Co.*

CIRCLE NO. 88, PAGE 13-14

Photoelectric control is covered in Bulletin PA 561, 24 pages, which contains specifications, descriptive

data and operational charts on systems for industrial control applications. *Electronics Corporation of America.*

CIRCLE NO. 89, PAGE 13-14

Furnace and oven controls, catalog B43-1 in 44 pages, is devoted to instrumentation for metal processing application and also includes specification and prices on vane-type millivoltmeter controllers, thermocouples, radiation detectors, limit controls and similar equipment. *Minneapolis-Honeywell Regulator Co.*

CIRCLE NO. 90, PAGE 13-14

Wood product catalog of 24 pages lists wood products manufactured to specification. Also shows properties of domestic woods and wood buying specifications. *American Wood Working Co.*

CIRCLE NO. 91, PAGE 13-14

Spectrophotometer is used for analyzing a wide variety of substances and will measure absorption spectra objectively, accurately and rapidly. Unit is manufactured in England. *The Jarrell-Ash Company.*

CIRCLE NO. 92, PAGE 13-14

Refractory products comprising the complete line are discussed in four-page, two-color catalog No. 200. Included are technical data tables and illustrations of products and product application. *J. H. France Refractories Company.*

CIRCLE NO. 93, PAGE 13-14

Pyrometer temperature controllers with three positions easily wired for specialized control applications are listed in Bulletin JT-1. Models have no vacuum tubes. *West Instrument Corporation.*

CIRCLE NO. 94, PAGE 13-14

Expandable conveyor, "Expand-o-veyor," comes in two sizes. Its description and specifications are contained in bulletin 755-R-10M, four pages which also includes other conveying equipment. *A. B. Farquhar Div., The Oliver Corporation.*

CIRCLE NO. 95, PAGE 13-14

Hand truck line includes 16 models, three of which are new. Catalog No. 453, four-pages, shows picture and description of each. Dimensional specifications are also listed. *Milwaukee Truck Co.*

CIRCLE NO. 96, PAGE 13-14

Vise catalog in eight pages covers models with pictures, prices and specifications. Line includes models for drill press, woodworking, standard

bench and hinged pipe vise types. *Wilton Tool Mfg. Co., Inc.*
CIRCLE NO. 97, PAGE 13-14

Blowers and exhausters, vacuum cleaning systems and pneumatic conveying systems are outlined in bulletin M-133, four pages with pictures and descriptive material. *U. S. Hoffman Machinery Corporation.*
CIRCLE NO. 98, PAGE 13-14

Electric motors, totally-enclosed, fan cooled motors 1/2 to 30 hp; drip-proof 1/2 to 40 hp; and explosion-proof, 1/2 to 30 hp are described in Bulletins 51 B 7225D, 51 B 6210G and 51 B 7286G. These are six pages each and in color. *Allis-Chalmers Manufacturing Company.*
CIRCLE NO. 99, PAGE 13-14

Fork truck brochure, 16 pages with three-colors, discusses engineering features on six-model line and includes photographs and drawings. Thirty-four major components which are interchangeable are also included. *Clark Equipment Company.*
CIRCLE NO. 100, PAGE 13-14

Precision grinding wheel bulletin GP-56 covers new developments in centerless, surface, internal and cylindrical grinding. *Electro Refractories & Abrasives Corp.*
CIRCLE NO. 101, PAGE 13-14

Gravity roller bulletin, No. 801 with two colors and eight pages, covers wheel and roller types and has section on accessories. *A. B. Farquhar Div., The Oliver Corporation.*
CIRCLE NO. 102, PAGE 13-14

Portable lift reprint gives factors to consider in choosing materials handling equipment. Related applications are also discussed. *The Oster Manufacturing Co.*
CIRCLE NO. 103, PAGE 13-14

Control fundamentals and their application to combustion are discussed with sections on key components, safety, efficiency and terminology in 14-page publication. *Cleveland Fuel Equipment Company.*
CIRCLE NO. 104, PAGE 13-14

Heating elements for electric furnace and kiln operations are made of self-bonded silicon carbide with aluminum-sprayed tips and metal-impregnated ends are discussed in six-page brochure. *Norton Company.*
CIRCLE NO. 105, PAGE 13-14

Wet blasting applications discussed in series of folders. Topics covered

are deburring, abrasive selection, finishing of dies and molds, honing cutting tools and cleaning prior to electro-plating. *The Cro-Plate Co., Inc.*

CIRCLE NO. 106, PAGE 13-14

Metallic powder cutting equipment is covered in four pages. Catalog 804J. Both vibratory and pneumatic type powder feeders and hand and machine torches are illustrated. *Air Reduction Company, Inc.*

CIRCLE NO. 107, PAGE 13-14

Checks and tag catalog E200 C1 gives entire line on metal name plates, checks, tags, tokens and badges. Also includes designs with lettering available. *Jas. H. Matthews & Co.*

CIRCLE NO. 108, PAGE 13-14

"How Fluid Power Serves Industry and You", prepared by the Education Committee of the National Fluid Power Association illustrates the mechanics and applications of the system. *Miller Fluid Power Div.*

CIRCLE NO. 109, PAGE 13-14

Resin coated sand booklet No. 12 in 16 pages, has simplified procedure covering coating methods, solvents, test methods, etc. *Durez Plastics & Div. Hooker Electrochemical Co.*

CIRCLE NO. 110, PAGE 13-14

Quicker Than You Can Say..

A combination of jaw-breaking chemical jargon has proved to be the most effective extinguisher of magnesium fires tested by the Air Force. Magnesium fires are difficult to extinguish because of their great reactivity with common fire extinguishers.

Chlorobromomethane combined with a 50 per cent solution of the liquids di-isodecyl phtalate or ethanol has proved to be the best answer to date.

Information on these tests are included in *A Study of Magnesium Fire Extinguishing Agents* and may be ordered from OTS, U. S. Department of Commerce, Washington 25, D. C. for $3.75. It contains 149 pages.

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 13-14.

afs chapter meetings

NOVEMBER

1 . . Western New York . . Sheraton Hotel, Buffalo, N. Y. Emil Piper, Pohlman Foundry, *"A Glimpse At European Foundries"* and travelogue.

5 . . Central Illinois . . American Legion Hall, Peoria, Ill. William Ball, Jr., R. Lavin & Sons, Inc., *"Human Engineering."*

5 . . Chicago . . Chicago Bar Assn., Chicago. Robert E. Kennedy Scholarship Presentation. Round Table Meeting. Gray Iron & Malleable Iron Div.: Harvey Henderson, Lynchburg Foundry, *"Water Cooled Cupola;"* Steel Div.: H. H. Johnson, National Malleable & Steel Castings Co., *"Gases in Steel Castings;"* Patterns & Non-Ferrous Div.: P. von Colditz, Canadian Car & Fdy. Co., Ltd., *"Plastic Patterns and Core Boxes;"* Maintenance & Engineering Div.: R. W. Jones, Illinois Manufacturing Assn., *"Will the New Chicago Zoning Laws Put You Out of Business?"*

5 . . Metropolitan . . Essex House Hotel, Newark, N. J. Hans Jacobs, Lehigh, Inc.; Paul Ducharine, Doran Manganese Bronze Co., *"The Practical Application of the CO_2 Process."*

7 . . Toledo . . Heather Downs Country Club, Toledo, Ohio. Clyde A. Sanders, American Colloid Co., *"Casting Finish, Tolerance and Precision of Sand Castings."*

8 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. J. A. Mueller, Bonded Abrasives Div., Carborundum Co., *"Save On Snagging and Cut-Off."*

8 . . St. Louis District . . York Hotel, St. Louis. J. B. Caine, foundry consultant, *"Can We Make Perfect Castings?"*

8-9 . .Eastern Canada, Ontario . . Mt. Royal Hotel, Montreal, Que. All-Canadian Foundry Conference.

9 . . Philadelphia . . Engineers Club, Philadelphia. Howard Wilder, Vanadium Corp. of America, *"Cupola Practice."*

9 . . Wisconsin . . Schroeder Hotel, Milwaukee. Sectional Meeting.

9 . . Corn Belt . . Rome Hotel, Omaha, Neb. Frank M. Scaggs, Oklahoma Steel Castings Co., *"Coremaking With CO_2 Process."*

12 . . Michiana . . Club Normandy, Mishawaka, Ind. D. E. Krause, Gray Iron Research Institute, Inc., *"Foundry Research and Development."*

12 . . Timberline . . Oxford Hotel, Denver, Colo. Frank M. Scaggs, Oklahoma Steel Castings Co., *"Coremaking With CO_2 Process."*

13 . . Rochester . . Hotel Seneca, Rochester, N. Y. Alfred B. Steck, General Electric Co., *"CO_2 Process."*

13 . . Twin City . . Covered Wagon, Minneapolis. Joint Meeting with ASM. Dr. H. S. Jerabek, University of Minnesota, *"Structure of Metals."*

13 . . No. Ill.-So. Wis. . . LaFayette Hotel, Rockford, Ill. S. C. Massari, technical director, American Foundrymen's Society, *"Marketing Your Product."*

14 . . Oregon . . Heathman Hotel, Portland, Ore. Dr. William H. Rice, Electric Steel Foundry Co., Portland, *"Utilization of Modern Welding Techniques for Foundries."*

16 . . Birmingham . . Tutwiler Hotel, Birmingham, Ala. Ferrous Section: D. E. Krause, Gray Iron Research Institute, Inc., *"Elements of Good Foundry Metallurgy;"* Non-Ferrous Section: B. N. Ames, Columbian Bronze Corp., *"Metallurgy in the Brass Foundry."*

16 . . Tri-State . . Tulsa, Okla. Ray Cochran, R. Lavin & Sons, *"Causes and Corrections of Aluminum Casting Defects."*

19 . . Quad City . . Hotel Ft. Armstrong, Rock Island, Ill. L. W. Kohlmeyer and F. H. Toman, Wheelabrator Corp., *"Selection, Operation, and Maintenance of Blast Cleaning Equipment."*

19 . . Pittsburgh . . Webster Hall Hotel, Pittsburgh, Pa. Clyde B. Jenni, General Steel Castings Co., *"Design of Steel Castings to Meet Competitive Materials."*

21 . . Central Michigan . . Hart Hotel, Battle Creek, Mich. Roy Carver, Carver Products Co., *"CO_2 Process."*

23 . . Ontario . . Prince Edward Hotel, Windsor, Ont. Plant visitations to Ford, (Canada) Ltd., Auto Specialties, Ltd., Walker Metal Products, Ltd., Bryant Pattern Works, Ltd.

29-30 . . Central Michigan, Detroit, Saginaw Valley, Michigan State University, University of Michigan . . University of Michigan, Ann Arbor. Michigan Regional Foundry Conference.

30 . . Chesapeake . . Engineers Club, Baltimore, Md. Clyde A. Sanders, American Colloid Co., *"What Sand for What Type of Casting."*

DECEMBER

3 . . Chicago . . Chicago Bar Assn., Chicago. Round Table Meeting. Gray Iron and Patterns Div.: W. T. Schmidt, Giddings & Lewis Machine Co., *"Casting Design and Lower Casting Cost;"* Malleable Iron Div.: R. Greenlee, Auto

Specialties, *"Control to Eliminate Hot Tears;"* Steel Div.: Richard Ames, Illinois Carnegie Steel Co., *"Practical Testing & Selection of Refractories;"* Non-Ferrous & Maintenance Engineering Div.: W. O. Hanson, Allis-Chalmers Co., *"Noise, Vibration, Smoke."*

3 . . Central Indiana . . Athenaeum Turners, Indianapolis. Representatives from eight local foundries, *"Know Your Area Foundries."*

5 . . Toledo . . Heather Downs Country Club, Toledo, Ohio. L. W. Thayer, Cadillac Motor Car Div., General Motors Corp., *"Gray Iron Gating."*

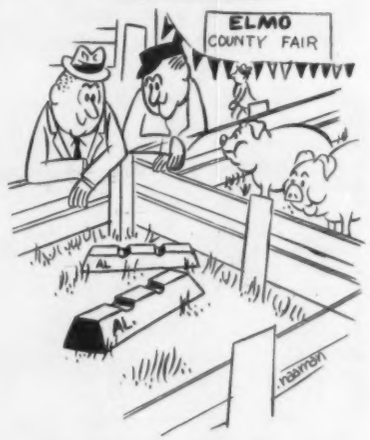
7 . . Tri-State . . Tulsa, Okla. Christmas Party.

7 . . Northeastern Ohio . . Hotel Carter, Cleveland. Christmas Party.

8 . . Twin City . . Leamington Hotel, Minneapolis. Christmas Party.

8 . . Central Ohio . . Lincoln Lodge, U. S. Rt. 40, near Alton, Ohio. Christmas Party.

8 . . Central Illinois . . American Legion Hall, Peoria, Ill. Christmas Party.



GIFS Opens Marketing Plan

Questionnaires seeking answers on how gray iron foundries can best serve their customers are being mailed to several thousand purchasing agents.

Richard Meloy, marketing director of the Gray Iron Founders' Society, sponsors of the plan, states that this is the initial step in creating a marketing program.

Typical questions include whether pricing should be based on a pound or per piece basis, if there are any special types or classes or iron castings which are difficult to procure, and the importance of price, quality, etc.

classified advertising

For Sale
Help Wanted,
Personals,
Engineering Service, etc.,

Help Wanted

RESEARCH ENGINEER. Opening in nationally known research laboratory of nation's largest steel casting company. College graduate with 0-5 years experience desired. Background in ceramics, chemistry, chemical engineering or metallurgy preferred. Opportunity for work in all phases of steel casting manufacturer. Salary open. **White to J. A. Rassenfoss—American Steel Foundries, East Chicago, Indiana.**

WANTED—PATTERN SALES REPRESENTATIVE. Modern, well-equipped and established pattern shop with A-1 rating in middle west, 75 miles from Ohio-Indiana and Kentucky lines. Need patternmaker with some foundry experience along with a practical and technical experience in wood and metal patternmaking to expand our sales force. Should be able to quote pattern prices and handle customer relations in 150 mile area. Would consider training the right man. Salary open. Please submit resume and salary expected. All replies kept confidential. **Box C185, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY TECHNICIAN OR QUALITY CONTROL ENGINEERING ASSISTANT

Mechanized gray iron foundry in Ohio producing quality engineering jobbing castings. Applicant should have some technical background, training or experience in one or more of the following fields—Metallurgy, Cupola Control, Sand Control, Gating and Risering. This position will offer many opportunities in increasing efficiency and control on all foundry operations including practical research, development and application on new foundry processes such as shell process and CO_2 process. Earnings will be dependent on qualifications and ability. **Box C160, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

COREROOM FOREMAN
MOLDING FOREMAN
COREMAKERS
MOLDERS

A jobbing and captive foundry specializing in producing large and heavy castings has positions available for Corerooom Foreman, Molding Foreman, Coremakers and Molders. A rapidly expanding concern with excellent opportunities for qualifying applicants. Located in the Upper Peninsula of Michigan. Must have experience producing large and heavy castings. Submit qualifications to: **Box C164, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

CASTING ENGINEER. Position open with a large non-ferrous foundry located in the midwest for an engineer with a background in foundry practices. Duties will include working out of our laboratory with the production foundry on the development of processes and related problems. Excellent starting salary and company benefits. Please write stating full particulars including salary requirements and availability. All replies held in strict confidence. **Box C189, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

SALES MANAGER

Southwest Foundry has opportunity for a steel castings man to become one of its top management men. Must have experence in steel and alloy castings at Sales Manager level, and have both executive management and personal sales ability. Engineering or metallurgical training required, some production knowledge helpful. Age 35-50. Desirable salary and bonus, excellent potential, and stock purchase plan. If you meet these qualifications, please reply in confidence. **Box C184, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

STEEL FOUNDRY FOREMAN. Immediate opening. Excellent opportunity in Milwaukee-Chicago area for young man with experience in light and medium sized castings. Salary in line with proven ability. Write giving qualifications, references and availability for personal interview. **Box C187, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

METALLURGICAL ENGINEER—Assistant in staff group engaged in testing and control of foundry alloys, sands, etc., and "trouble shooting". Firm operates non-ferrous foundry. Well recognized in its field, under progressive management. Offers opportunity for advancement for competent young man. **Box C188, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY SUPERINTENDENT Medium size production jobbing gray iron foundry in Southern Ohio needs qualified practical foundryman to take complete charge of all foundry operations. Give full particulars in first letter including age, height, weight, experience, education, salary requirements and references. **Box C175, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines.**

FOUNDRY FOREMAN For Southern Ohio gray iron foundry employing 90 men on production jobbing. Excellent opportunity for ambitious young man to supervise molding and coremaking. Send complete details including age, experience, salary desired, references, weight and height. **C176, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines.**

IMMEDIATE EMPLOYMENT AVAILABLE for experienced cleaning room foreman with good background, references. Salary based on ability. Chicago-Milwaukee location. Reply in confidence giving detailed resume. **Box C186, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

PARTNER WANTED. Experienced Foundryman as active partner in foundry manufacturing cast iron enameled plumbing fixtures. **Box C190, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

STEEL MELTER-Electric furnace. Foundry producing carbon low alloy and high alloy castings in East. Give particulars including experience and salary requirements. **Box C191, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

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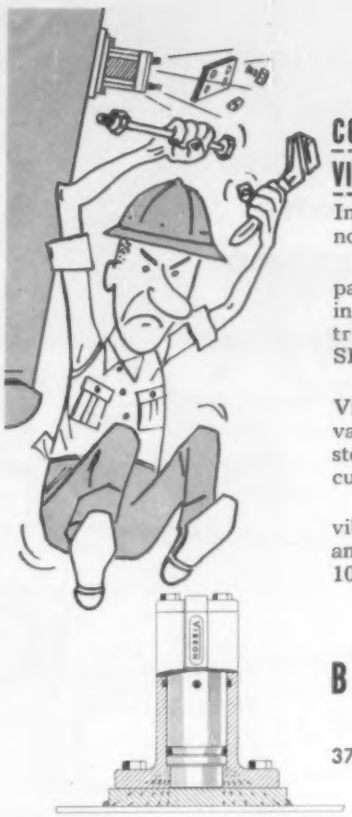

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Die Casting Continues Rise

Continuing growth of the die casting industry is indicated from figures presented to the 29th Annual American Die Casting Institute meeting in Chicago.

Zinc requirements for 1957 have been estimated at 420,000 tons compared to 355,000 tons in 1956 and 410,000 in 1955. Anticipated aluminum tonnage for 1957 is placed at 372 million lb or 40 million lb over 1956.

Officers elected for 1957 are William J. During, Precision Castings Div., Harsco Corp., Syracuse, N. Y. *president;* C. J. Sheehan, Die Casting Div., Aluminum Co. of America, Garwood, N. J., *vice-president;* David Laine and W. J. Parker, American Die Casting Institute, *secretary* and *treasurer* respectively.

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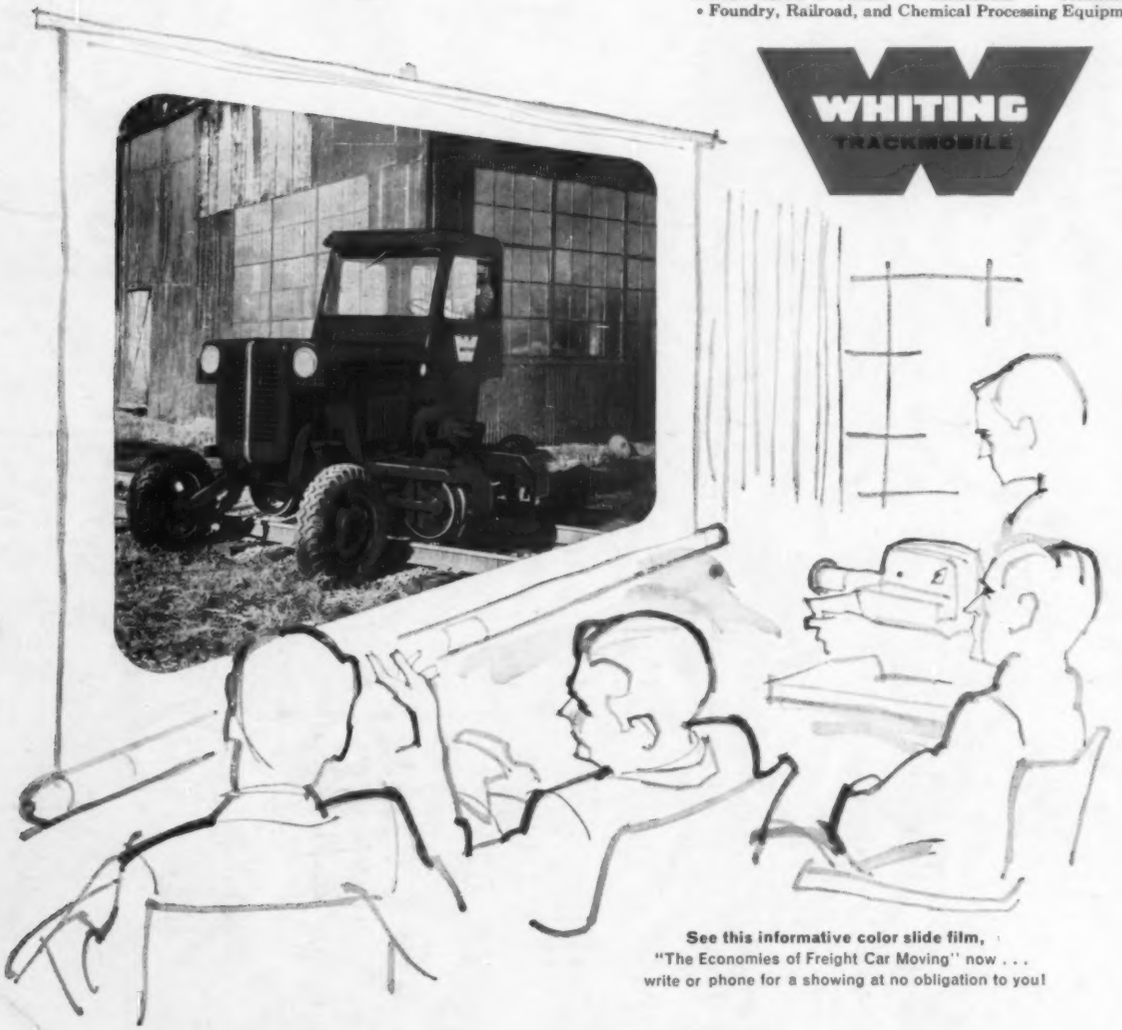

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